

CAMIRA

JB SERIES 1982/1984

SERVICE AND REPAIR MANUAL

MODELS

SEDAN
FLEET
SL
SLX
SLE
WAGON
SL
SLX
SLE

1982/1984

PRODUCED BY
GREGORY'S
SCIENTIFIC
PUBLICATIONS



**GREGORY'S SCIENTIFIC PUBLICATIONS
SERVICE AND REPAIR MANUAL No. 210**

CAMIRA



SEDAN

**GREGORY'S SCIENTIFIC PUBLICATIONS
SERVICE AND REPAIR MANUAL No. 210**

CAMIRA

JB SERIES

1982-1984

The information in this manual is derived from the latest models available for our workshop research, and other available sources at the times of preparing the editions which first covered the models listed above. While every effort has been made in preparing later editions to ensure that subsequent modifications by the manufacturer have been included, vehicles and parts vary in manufacture, sometimes even from specifications published by the manufacturer. Accordingly no guarantee or warranty is given that all such modifications are included in this manual.

While every precaution is taken to ensure the accuracy of the contents, no responsibility can be accepted for any misinterpretation or misapplication of the repair procedures described nor, apart from any warranties or conditions which might be implied by the Trade Practices Act and similar State and Territory Laws, can any liability be accepted for any errors or omissions in the text and/or illustrations.

**GREGORY'S SCIENTIFIC PUBLICATIONS
SYDNEY**

GREGORY'S SCIENTIFIC PUBLICATIONS
Service and Repair Manual No. 210

Published by
Gregory's Scientific Publications
A Division of Universal Press Pty. Ltd.
Sydney, Australia

Edited and photographed at the company's
Sydney editorial and research centre
904 Bourke St
Waterloo 2017
N.S.W.
AUSTRALIA

Printed by Times Printers Sdn. Bhd.
Singapore

First Edition: © Gregory's Scientific Publications August 1983.
First Reprint: June 1984
Second Reprint: February 1985
Second Edition: © Gregory's Scientific Publications May 1986.
First Reprint: April 1987

ISSN 0727-6117

ISBN 85566 589 0

All rights reserved. Gregory's Scientific Publications is the owner of the copyright subsisting in this publication. Other than as permitted by the Copyright Act, no part of this publication may be reproduced, copied or transmitted, in any form or by any means (electronic, mechanical, microcopying, photocopying, recording, storage in a retrieval system or otherwise), without the prior written permission of Gregory's Scientific Publications.

ACKNOWLEDGEMENT

GREGORY'S SCIENTIFIC PUBLICATIONS wish to thank the National Roads and Motorists Association and NRMA Smash Repairs Pty Ltd, Lidcombe, for their help in various aspects of preparing this manual.

CONTENTS

INTRODUCTION	7	CLUTCH	84
TOOLS-EQUIPMENT-SAFETY	8	Specifications	84
Tools and equipment	8	Clutch trouble shooting	84
Safety	10	Description	85
LUBRICATION AND MAINTENANCE	11	Clutch unit and release mechanism	85
Specifications	11	Clutch cable	88
How to grease and oil change	11	Clutch pedal	89
Service Schedule	13	Clutch adjustments	89
Lubrication chart	17	MANUAL TRANSAXLE AND DRIVE	
Maintenance chart	18	SHAFTS	91
WHEELS AND TYRES	19	Specifications	91
How to change a road wheel	19	Manual transaxle and drive shaft trouble shooting	91
Tyre wear trouble shooting	20	Description	93
Jacking information	21	Four speed transaxle assembly	
ENGINE TUNE-UP	23	Five speed transaxle assembly	104
Tune-up specifications	23	Gear lever assembly	107
Tune-up operations	23	Gear selector control rod assembly	107
ROADSIDE TROUBLE SHOOTING	30	Drive shafts	109
Trouble shooting	30	AUTOMATIC TRANSAXLE	112
To check ignition and electrical systems	30	Specifications	112
To check the fuel system	31	Automatic transaxle trouble shooting	112
To check the mechanical system	32	Description	112
ENGINE	34	Transaxle fluid	113
Specifications	34	Transaxle selector cable	114
Engine mechanical trouble shooting	35	Neutral safety switch	115
Description	38	Kickdown control cable	116
Engine assembly	38	Transaxle assembly	117
Camshaft drive belt	41	Drive shafts	118
Manifolds	43	STEERING	119
Cylinder head	44	Specifications	119
Camshaft, rocker arms and tappets	47	Steering trouble shooting	119
Engine sump	49	Description	120
Oil pump	50	Steering column assembly	120
Pistons, connecting rods and cylinder bores	52	Flexible coupling	122
Crankshaft and main bearings	55	Steering gear assembly	122
Flywheel/drive plate	57	Steering linkage	126
Engine mountings and torque damper	58	FRONT SUSPENSION	127
Exhaust system	60	Specifications	127
COOLING SYSTEM	62	Front suspension trouble shooting	127
Specifications	62	Description	128
Cooling system trouble shooting	62	Suspension unit	128
Description	63	Front hub bearings	131
Radiator	64	Control arm ball joint	131
Fan and motor assembly	66	Control arm and bushes	132
Thermostat	66	Stabiliser bar	132
Water pump	67	Suspension and steering angles	133
Thermostat housing	67	REAR SUSPENSION	135
Welch plugs	68	Specifications	135
Heater unit, water valve and controls	61	Rear suspension trouble shooting	135
FUEL SYSTEM	72	Description	136
Specifications	72	Rear hub	136
Fuel system trouble shooting	72	Shock absorber	137
Carburettor	73	Coil spring	138
Fuel pump	80	Stabiliser bar	139
Fuel filter	81	Rear axle assembly	139
Air cleaner	81	BRAKES	141
Throttle cable	82	Specifications	141
Fuel tank	83	Brakes trouble shooting	141

Contents

Description	143	PRODUCTION CHANGES	199
Master cylinder	144	POWER STEERING	200
Front wheel disc brakes	146	Description	200
Rear brake assembly	148	Preliminary inspection and testing	200
Handbrake lever and cable	150	In car adjustments and minor repairs	200
Brake servo unit	151	Power steering pump	202
Brake pedal	152	Power steering gear assembly	203
Brake adjustments	152	SUSPENSION	206
Hydraulic system	153	Rear coil springs	206
ELECTRICAL SYSTEM	155	Rear shock absorbers	206
Specifications	155	Front stabiliser bar	206
Battery and charging system trouble shooting	155	ELECTRICAL SYSTEM	207
Battery and starting system trouble shooting	157	Rear combination lamp	207
Lighting system trouble shooting	157	Number plate and reverse lamp assembly	207
Turn signal lamp system trouble shooting	158	Rear window wiper assembly	207
Ignition system trouble shooting	159	Rear window washer	208
Test equipment and some applications	159	WIRING DIAGRAM	209
Battery	160	BODY	210
Alternator	161	Tailgate	210
Starter motor	165	EMISSION CONTROL	212
Electrical ignition system	168	CONVERSION TABLES	213
Switches and controls	171	GLOSSARY OF NAMES AND TERMS	214
Lamp units	174		
Instrument cluster	176		
Speedometer cable	177		
Cooling system fan and motor assembly	177		

INTRODUCTION

This workshop manual has been researched and written by automotive engineers for the practically-minded car owner who wishes to maintain his vehicle in a safe, reliable and serviceable condition and, at the same time, reduce running and maintenance costs.

A vehicle of the type covered by this manual, was taken into our workshops where the repair methods described were proved in practice. To ensure that the reader can readily identify the components, and the operations described in the text, detailed photographs were produced during the workshop research for inclusion throughout this manual.

Each section contains step by step procedures for the removal and installation of components and, where applicable detailed instructions for the testing, overhaul and adjustment of them. For the technically minded, comprehensive specifications are given at the beginning of each section.

The importance of regular lubrication and maintenance is stressed and laid out in an easy to follow schedule. Keep to it and the life of the car and its components are greatly enhanced. Carrying out the schedule at the intervals specified also gives the opportunity of identifying any minor faults before they become catastrophes. A cracked fan belt, deteriorated water hose or faulty tyre is better dealt with in the convenience of your own garage rather than risk an expensive breakdown on the hard shoulder of the motorway.

Particular emphasis is also placed on the value of trouble shooting as the identification of the trouble source can, on occasion, be more of a problem than the cure. If used correctly, the extensive tables included on the majority of trouble causes and remedies should greatly assist in the saving of the time, temper and possible unnecessary expenditure.

Gregory's Service and Repair Manuals bring within the scope of many readers numerous tasks on the vehicle which can be tackled with confidence. The cost of this manual may well be recovered on the first occasion it is put to use, and personal satisfaction of a job well done is the inevitable bonus.

Inexperienced operators should not attempt to carry out a particular service operation before completely reading the appropriate section (or other sections which may be referred to) in the manual.

1. TOOLS AND EQUIPMENT

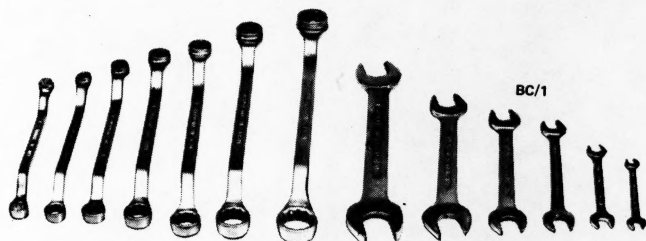
When servicing the modern motor vehicle, special tools are sometimes essential for overhaul and adjustment procedures on certain components. These special tools can be expensive and often require specialised knowledge to operate them, in which case it is more practical to take the vehicle or component to your authorised dealer for repair. Where possible the use of special tools is avoided in this manual and basic or substitute tools, which are described in the text, are used instead. Should it not be practical to carry out an operation without special equipment, then the reader is advised of this at the commencement of the operation.

To successfully carry out any form of mechanical repair work, adequate hand tools are essential. Do not be tempted to make do with old spanners, screwdrivers etc, that do not correctly fit the hardware on the vehicle, nor use new spanners of the wrong system such as A.F. on metric nuts and bolts. Besides damaging the hardware and/or 'rounding' the bolt heads and nuts, many a knuckle has been skinned by using inferior or incorrect tools.

The following list of basic tools, miscellaneous equipment and stores are suggested as being the initial requirements to enable the maintenance and repair work described in this manual to be carried out.

BASIC TOOL KIT

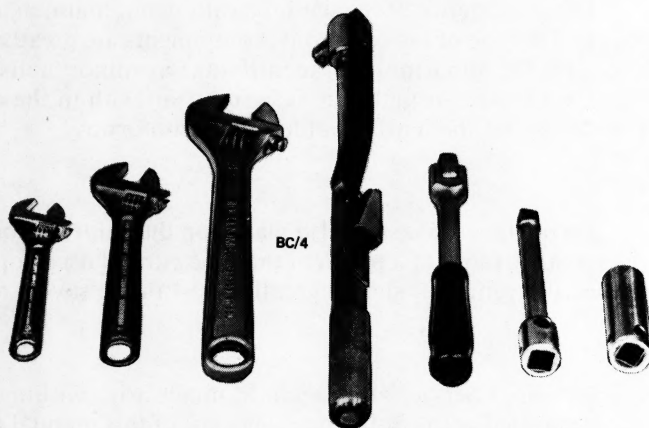
- 1 Set of open ended spanners.
- 1 Set of ring spanners.
- 1 Set of socket spanners.
- 1 Set of adjustable spanners.
- 1 Spark plug spanner.
- 1 Torque wrench.
- Assorted bladed screwdrivers.
- Assorted Philips screwdrivers.
- 1 Pair of ordinary pliers.
- 1 Pair of multigrip pliers.
- 1 Pair of vice grip pliers.
- 1 Pair of long nose pliers.
- 2 Pairs of circlip pliers.
- 1 Engineers hammer.
- 1 Set of pin punches.
- 1 Set of feeler gauges.
- 1 Set of magneto spanners.
- 1 Points file.



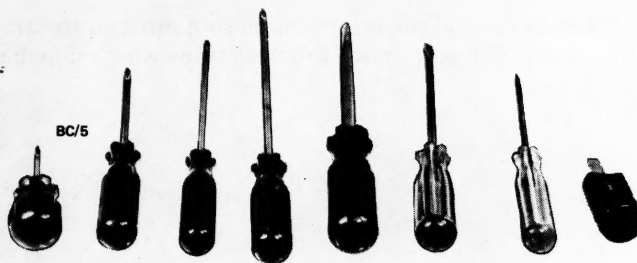
Ring and open ended spanners.



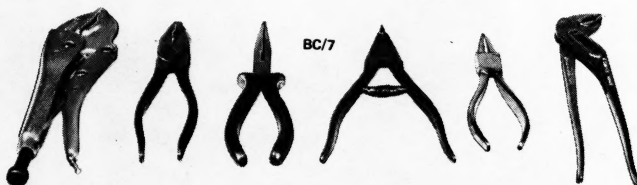
Socket spanner set.



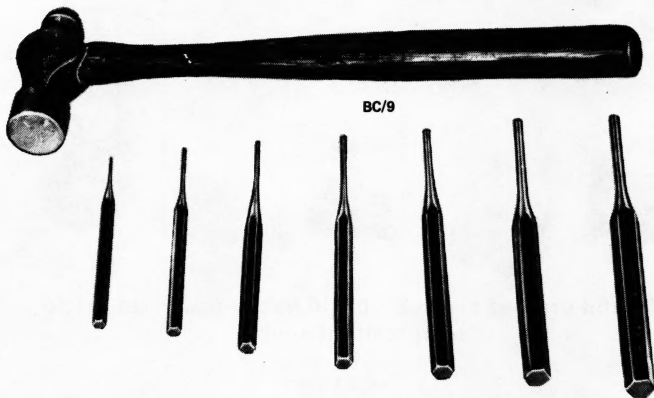
Adjustable spanners, torque wrench and spark plug socket spanner with socket extension and swivel bar.



Assorted Philips and bladed screwdrivers.



Vice grip pliers, ordinary pliers, long nose pliers, circlip pliers (expanding type), circlip pliers (contracting type) and multigrip pliers.



Engineers ball pein hammer and pin punch set.



Points file, magneto spanners and feeler gauge set.

TOOL SELECTION AND CARE

As sensible selection of tools can greatly influence the ease and quality of work performed by the operator, it is good advice to purchase the highest quality of tools that can be afforded. Tools which bear the makers name are usually the best. The cheaper case hardened variety of tools should be avoided as once the case hardening is worn through it will be found that the tools are no longer serviceable. Hand tools with joints such as adjustable spanners and pliers should have no appreciable slack in the joints. There is nothing more annoying than to set a crescent spanner to a given nut and find that the jaw dimensions keep altering.

To ensure that all hand tools see out a normal working life tool care is also very important. After each job undertaken, all tools should be thoroughly washed in kerosene or some other type of cleaning agent and then wiped dry with a clean cloth.

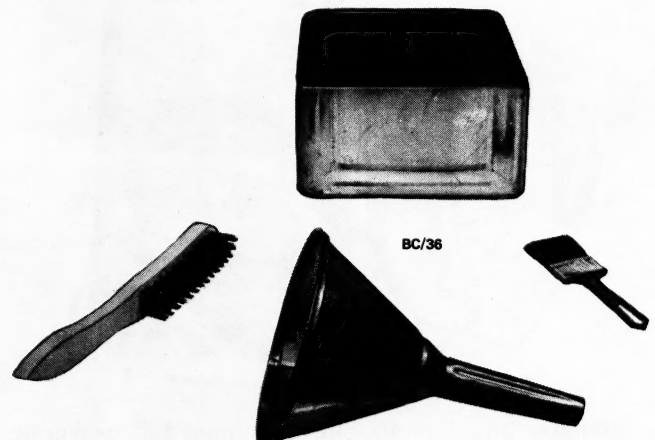
When cleaning the tools ensure that all grit is removed, especially from the joints in pliers and adjustable spanners. If the tools are to be stored for any

length of time it is also good policy to wipe them over with an oily cloth. Feeler gauges should be given particular attention and must be kept scrupulously clean at all times as grit on the blades will cause damage to the blades and inaccuracy when measuring. To prevent the feeler gauge blades from rusting and pitting through moisture the blades should be wiped over with an oily cloth after each use.

To prevent hand tools and other equipment from becoming mislaid and to ensure uncluttered working surroundings all hand tools should be stored in either a tool box or on a shadow board. If it is not intended to transport the tools then the latter method is recommended for the 'do-it-yourself' mechanic. Besides having all tools within easy reach, a visible check can be made of the shadow board at any time to see if any tools are missing.

MISCELLANEOUS EQUIPMENT AND STORES

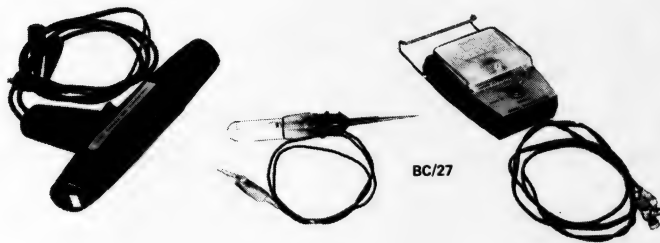
- 1 Hydraulic jack.
- 1 Set of car ramps.
- 1 Set of chassis stands.
- 1 Hand grease gun with flexible attachment.
- 1 Oil can.
- 1 Oil gun.
- 1 Filter removing tool.
- 1 Oil recepticle and parts washing tin.
- 1 Funnel.
- 1 Wire brush.
- 1 Parts washing brush.
- 1 Tin of brake fluid.
- 1 Tin of engine oil.
- 1 Tin of transmission oil.
- 1 Tin of rear axle oil.
- 1 Tin of chassis grease.
- 1 Test lamp.
- 1 Dwell/Tach meter.
- 1 Timing light.
- 1 Ohmmeter.



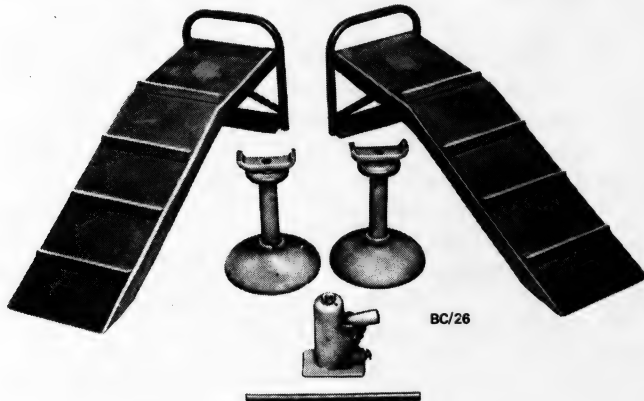
Wire brush, funnel and parts washing tin and brush.



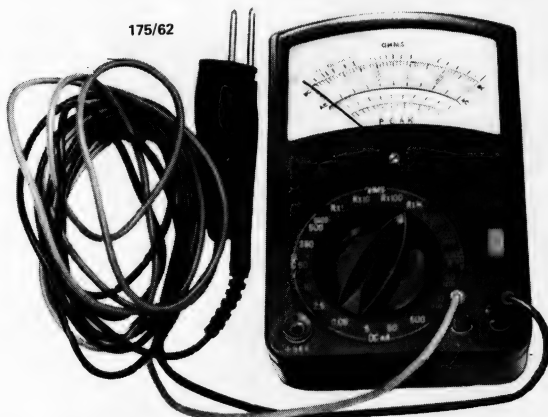
Oil gun, grease gun, oil can and filter removal tool.



Timing light, test lamp and dwell/tach meter.



Car ramps, chassis stands and hydraulic jack.



Ohmmeter (multimeter). An instrument for measuring electrical resistance.



Oils and greases are available in handy pack size for do-it-yourself lube jobs.

2. SAFETY

Never work *under* a vehicle which is supported only by the vehicle jack, bricks or similar materials as these are seldom stable. Always support the vehicle on chassis stands or use car ramps. Even in an emergency try to avoid jacking up the vehicle on soft or uneven ground.

When lifting either end of the vehicle ensure that the wheels remaining on the ground are fully chocked in both directions.

Avoid spilling oil or water around or under the working area, apart from the mess, you can easily lose your footing when exerting pressure on a particularly stubborn component.

When power tools are used make sure they are correctly fused and earthed with all connections and plugs tight and effectively insulated.

Always check that equipment being used for the lifting of heavy components such as engine and/or transmission is not exceeding its capacity and that ropes and slings are correctly secured and of adequate strength.

Every precaution should be taken when working on brake assemblies to avoid inhaling the brake dust which results from wear of the friction material. DO NOT attempt to remove dust by air pressure or vigorous brushing. A vacuum cleaner of either the domestic, or battery operated type designed for vehicles, with hose attachment is the most conveniently safe method of brake dust removal.

For the safety of the vehicle always disconnect the battery when carrying out any operation to the electrical or fuel systems. However, a battery should NOT be disconnected on a vehicle fitted with an alternator *when the engine is running*, or the alternator will be damaged.

The information in this manual is derived from the latest models available for our workshop research, and from other available sources at the time of writing. Any subsequent modifications will need to be taken into consideration by the operator.

While every precaution is taken to ensure the accuracy of the contents, onus can not be accepted for any misinterpretation of the described repair operations or for any errors or omissions inadvertently made, or for any injury or damage no matter how caused.

SPECIFICATIONS

CAPACITY AND GRADE

Engine:

Lubricant Castrol GTX

Sump capacity -

With filter 3.3 litres

Without filter 3.0 litres

Cooling system:

Capacity 8.0 litres

Corrosion inhibitor quantity 0.4 litres

Manual transaxle:

Lubricant Castrol 80W

Capacity 2.0 litres

Automatic transaxle:

Lubricant Dexron IID

Capacity service refill -

Early 3.8 litres

Late 5.0 litres

Steering:

Lubricant Shell Alvania EPRO

Capacity 50 grams

Brake fluid type Castrol GT-LMA

Front suspension:

Ball joint lubricant Castrol LMM grease

Fuel tank capacity 60 litres

NOTE: Lubricant capacities are approximate only. The correct lubricant level should be checked at the level plug or dipstick.

TORQUE WRENCH SETTINGS

Manual transaxle:

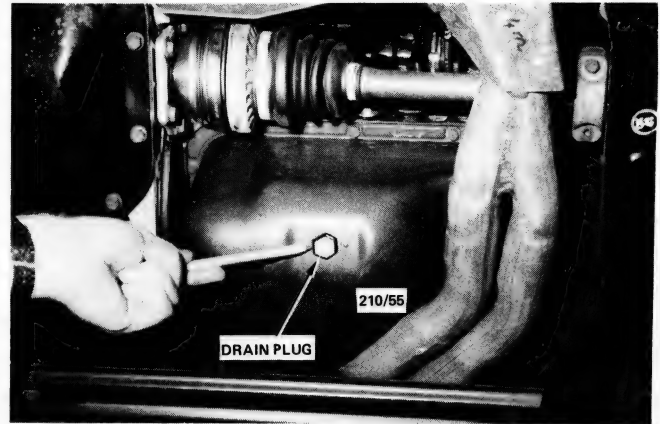
Breather plug 4 Nm + 45 to 180 degrees

Level plug 10 Nm

1. HOW TO GREASE AND OIL CHANGE

TOOLS, STORES AND EQUIPMENT NEEDED

- 1 Torque wrench.
- 1 Set of ring spanners.
- 1 Hydraulic jack.
- 1 Set of car ramps.
- 1 Set of chassis stands.
- 1 Hand grease gun with flexible attachment.
- 1 Oil can.
- 1 Oil gun.
- 1 Filter removal tool.
- 1 Oil receptacle and parts washing tin.
- 1 Funnel.
- 1 Wire brush.
- 1 Parts washing brush.
- 1 Tin of brake fluid.
- 1 Tin of engine oil.
- 1 Tin of trans axle oil.
- 1 Tin of chassis grease.
- 1 Stick of dry lube.



Location of engine sump drain plug.

NOTE: All lubricant capacities and grades for the various assemblies can be obtained by referring to the Specifications part of this section.

TO DO THE JOB

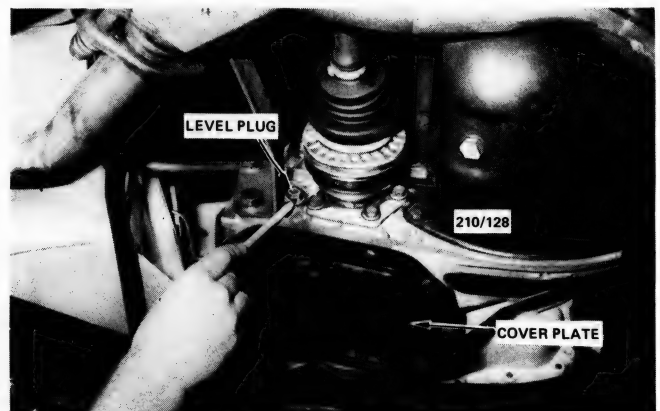
(1) Run the rear of the vehicle onto the car ramps and stop the engine.

(2) Raise the front of the vehicle with the jack and place chassis stands under the front jacking points. Refer to the Wheels and Tyres section for the location of the jacking points.

NOTE: It is best if the vehicle is kept as level as possible to avoid false readings when checking the lubricant levels.

(3) Using a wire brush and a cloth, clean around the engine sump drain plug, transaxle breather plug, level plug and all grease nipples.

(4) Place a drain tin under the engine sump, remove the engine sump drain plug with the appropriate size ring spanner and allow the engine sump to completely drain.



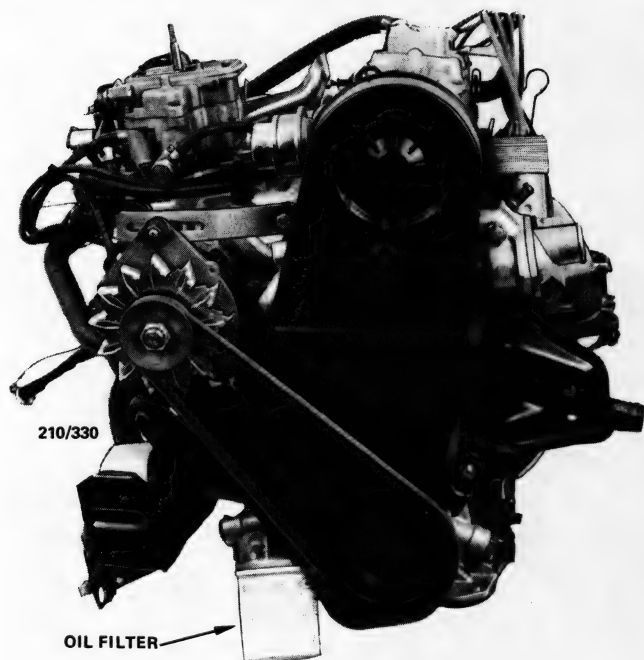
Location of manual transmission level plug and cover plate.

NOTE: It is best to drain the engine sump with the oil at operating temperature. However if the oil is hot take care to avoid scalding.

When the engine has completely drained, instal and firmly tighten the sump drain plug. Wipe around the plug after installing.

NOTE: Before installing the sump drain plug check the plug sealing gasket to ensure that it is serviceable.

(5) If the engine oil filter is to be renewed, remove the oil filter with the filter removal tool and allow the residual engine oil to drain into the drain tin. Smear oil onto the sealing gasket of the new filter and tighten the filter by hand as per the tightening instructions supplied with the new filter.

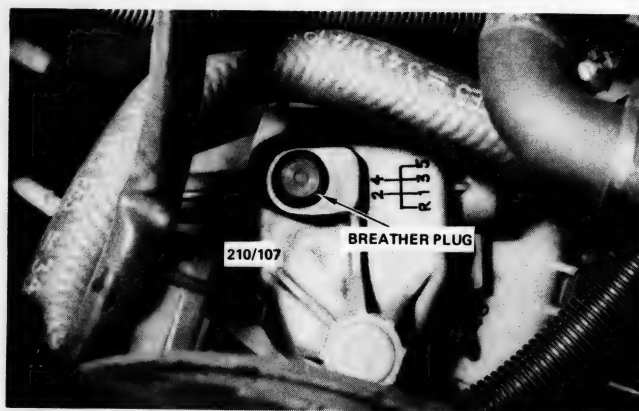


Right hand side view of engine showing the location of the oil filter.

IMPORTANT: Before installing the new filter ensure that the sealing gasket from the old filter has not come away from the old filter and adhered itself to the filter sealing seat on the engine.

(6) Remove the level plug from the manual trans-axle. Use the finger or a bent piece of wire to check the oil level. The correct level is when the oil is level with, or fractionally below the bottom of the plug hole. Overfilled units should be drained until the oil is level with the bottom of the plug hole.

If the oil level is low, remove the breather plug and use the oil gun to fill the transaxle to the correct level with the specified oil.



Location of manual transmission breather plug.

NOTE: On automatic transmission vehicles, refer to the Automatic Transmission section for the checking and topping up procedures.

When satisfied that the level is correct, instal and tighten the breather and level plugs to Specifications. Wipe around the plugs with cloth after installing. After the breather plug has been installed, ensure that the plastic cover is free to rotate.

NOTE: To drain the manual transaxle oil, it will be necessary to remove the transaxle cover plate.

(7) Fill the grease gun with chassis grease and grease all grease nipples until the grease is forced out of the joints. Take care not to dislodge the dust and water seals from the ball joints. Renew grease nipples that are blocked or damaged.

(8) Using the funnel, fill the engine with the specified amount and grade of engine oil and start and run the engine for a few minutes. Ensure that the oil pressure warning lamp goes out. Stop the engine, wait for at least ten minutes and check the oil level on the dipstick. If necessary add oil to bring the level to the full mark on the dipstick.

NOTE: To prevent overfilling initially, it is good policy not to pour all of the specified



Lubricate the suspension ball joints at the recommended intervals.

amount of the oil into the engine in one go as sometimes the amounts specified are only approximate. It is best to hold back at least half a litre and top up to the level mark on the dipstick after the engine has been run for a few minutes.

(9) Check thoroughly for oil leaks at the engine sump plug and engine oil filter if a new filter was fitted.

(10) Referring to the Lubrication and Maintenance Service Schedule, lubricate and check all other items which coincide with the grease and oil change intervals.

(11) Lower the vehicle to the ground.

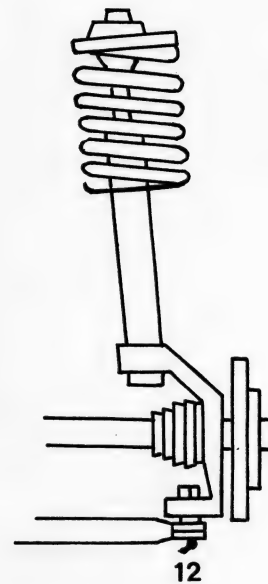
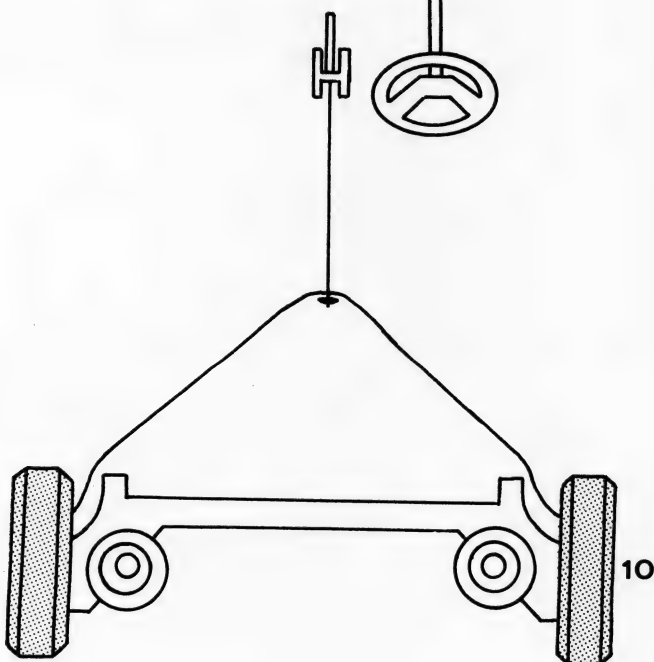
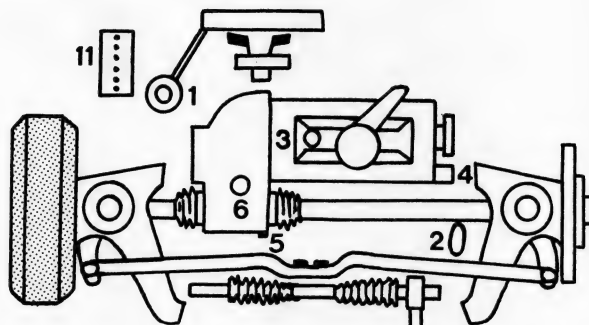
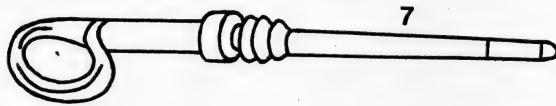
2. SERVICE SCHEDULE

JOB	daily or 1000 km	THOUSAND KILOMETRES							
		10	20	30	40	50	60	70	80
ENGINE (1) Check the oil level on the dipstick each time the fuel tank is topped up or every 1,000 km. Top up as necessary with the correct grade of engine oil. (2) Drain and refill the crankcase and renew the oil filter every 10,000 km or six months. <i>NOTE: When driving under severe or dusty conditions it is recommended that the engine oil and filter are changed more frequently.</i> (3) Check the condition of the camshaft drive belt and inspect the belt for cracks or excessive wear every 40,000 km or twenty four months. (4) Check the condition and the security of the engine mountings every 10,000 km or six months. (5) Check the condition and the security of the exhaust system every 20,000 km or twelve months. (6) Check and adjust as necessary the alternator drive belt every 10,000 km or six months.	•								
		•	•	•	•	•	•	•	•
					•				•
		•	•	•	•	•	•	•	•
			•		•		•		•
		•	•	•	•	•	•	•	•
COOLING SYSTEM (1) Check the coolant level in the coolant surge tank daily or every 1,000 km. <i>NOTE: Do not remove the coolant surge tank cap if the engine is hot and there is any evidence of pressure in the cooling system.</i> (2) Drain, flush and refill the cooling system every 20,000 km or twelve months. Add corrosion inhibitor. If operating in cold climates, instal anti-freeze mixture. (3) Check the radiator and heater hoses for deterioration every 10,000 km or six months. (4) Check the operation of the cooling fan every 10,000 km or six months.	•								
			•		•		•		•
		•	•	•	•	•	•	•	•
		•	•	•	•	•	•	•	•

[illegible]

JOB									
		10	20	30	40	50	60	70	80
WHEELS AND TYRES (1) At least once a fortnight check and adjust the tyre pressures when the tyres are cold. Frequent loss of pressure should be investigated and the leakage rectified. <i>NOTE: the recommended tyre pressures and sizes of tyres which can be fitted to the vehicle are printed on a placard which is positioned on the inside of the glove compartment lid.</i> (2) Check the front wheel toe-in every 20,000 km or twelve months and adjust as necessary. (3) Inspect the tyres regularly for damage and abnormal wear. Any abnormal wear may be due to one or more of the faults shown in the illustrations in the Wheels and Tyres section. (4) Rotate and balance the wheels and tyres to equalise tyre wear as necessary.									

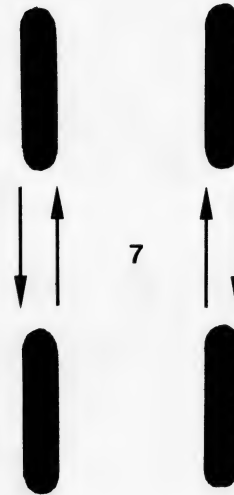
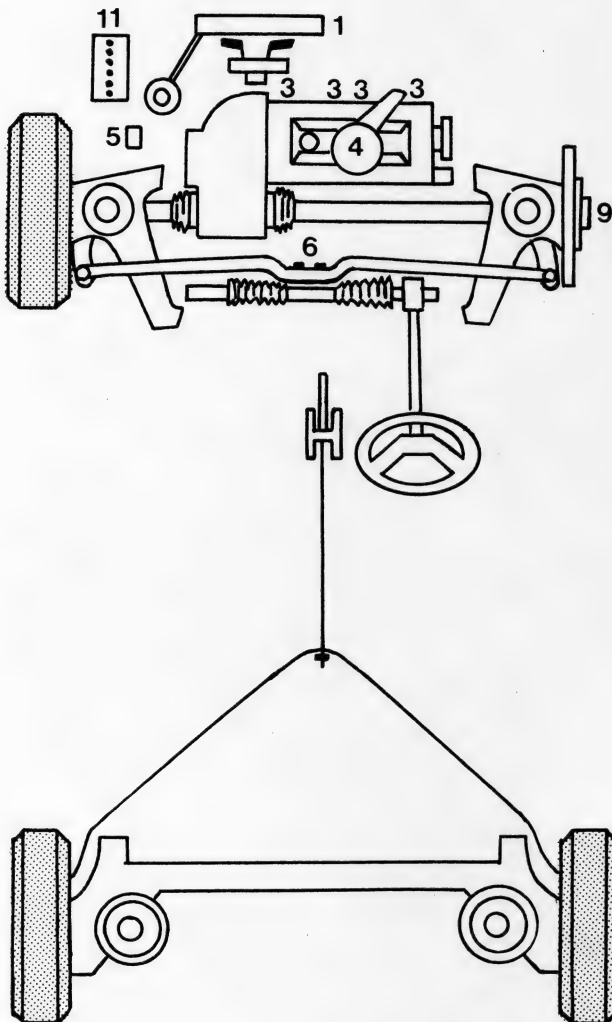
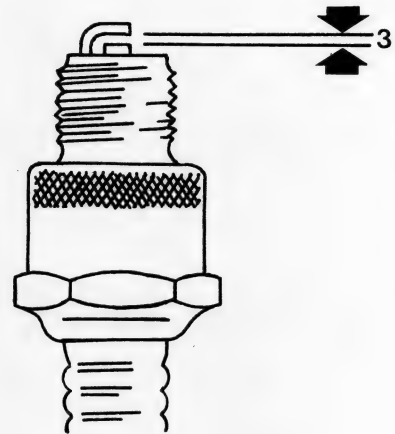
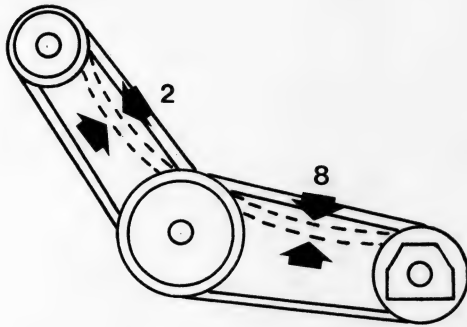
3. LUBRICATION CHART



LUBRICATION KEY

1. Coolant surge tank.
2. Brake master cylinder reservoir.
3. Oil filler.
4. Oil filter.
5. Manual transaxle level plug.
6. Manual transaxle filler plug.
7. Engine oil dipstick.
8. Automatic transaxle dipstick — Hot.
9. Automatic transaxle dipstick — Cold.
10. Rear hub bearings.
11. Battery.
12. Front suspension ball joints.

4. MAINTENANCE CHART

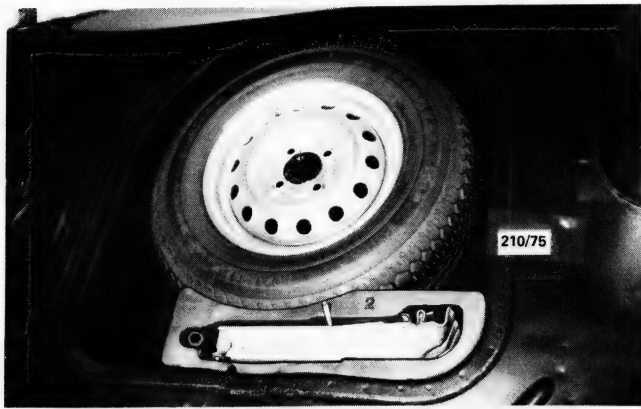


MAINTENANCE KEY

1. Radiator.
2. Alternator drive belt tension checking point.
3. Spark plugs and plug gap measuring point.
4. Carburettor and air cleaner assembly.
5. Fuel filter.
6. Steering gear and linkage.
7. Tyre rotation diagram.
8. Air conditioning belt tension checking point.
9. Front brakes.
10. Rear brakes.
11. Battery.

1. HOW TO CHANGE A ROAD WHEEL

- (1) Ensure that the vehicle is level, on firm ground and clear from any passing traffic.
- (2) If necessary switch on the hazard flashers.
- (3) Place the transmission in the P (Park) position on automatic transmission models or reverse gear on manual transmission models.
- (4) Firmly apply the handbrake.
- (5) Open up the luggage compartment lid and remove any loose items that may obstruct access to the spare road wheel.



Installed view of spare road wheel, jack and wheel spanner.

- (6) Fold back the floor mat and remove the spare road wheel cover.
- (7) From the spare road wheel well, remove the compartment in which the jack and the wheel spanner are stored.
- (8) Remove the jack and the wheel spanner from their compartment.
- (9) Unscrew and remove the spare road wheel securing nut and remove the spare road wheel from the vehicle.

NOTE: Ensure that the tyre on the spare road wheel is fully inflated and in a serviceable condition.



Chock the wheel diagonally opposite to the wheel being removed.

(10) When changing a road wheel, always chock the road wheel diagonally opposite the wheel being removed. Ensure that the wheel is chocked at the front and the rear of that wheel.

(11) On models fitted with alloy wheels and on models fitted with steel wheels and hub caps, insert the bladed section of the wheel spanner into the hub cap recess and gently prise the hub cap from the wheel.

NOTE: On models fitted with centre dress caps the wheel bolts retain the caps in position, do not attempt to prise the centre caps off.

(12) Instal the wheel spanner to a wheel bolt in such a manner that the bar end of the spanner is horizontal and on the left hand side of the wheel. Apply pressure to the end of the spanner in an anti-clockwise direction and slacken the wheel bolt approximately half a turn.

(13) Carry out the above mentioned procedure on the remaining wheel bolts.

(14) Fold back the jack handle to bring it in line with the winding mechanism and position the jack beneath the relevant jacking point.



View of jack installed to front jacking point.

NOTE: Jacking points are situated beneath the body sill panel behind the front wheels and in front of the rear wheels. They are identified by a cut-away in the sill panel.

(15) Rotate the jack handle clockwise and position the centre of the jack arm and the base of the jack directly beneath the cut-away in the sill panel.

Continue to rotate the jack handle and slightly raise the vehicle. Check that the jack is still positioned correctly on the jacking point.

(16) Ensuring that the jack is correctly positioned raise the vehicle so that the road wheel and tyre clears the ground. Allow enough clearance between the tyre and the ground for the spare wheel to be installed.

NOTE: Under no circumstance get under the vehicle whilst the jack is the only means of support.



View of jack installed to rear jacking point.

(17) Remove the wheel bolts and where fitted, the centre dress cap. Withdraw the road wheel from the wheel hub.

(18) Fit the spare road wheel to the hub, instal the centre cap where applicable, and instal the wheel bolts.

(19) Using the wheel spanner secure the wheel bolts progressively as much as possible ensuring that the wheel bolts correctly engage the wheel bolt holes.

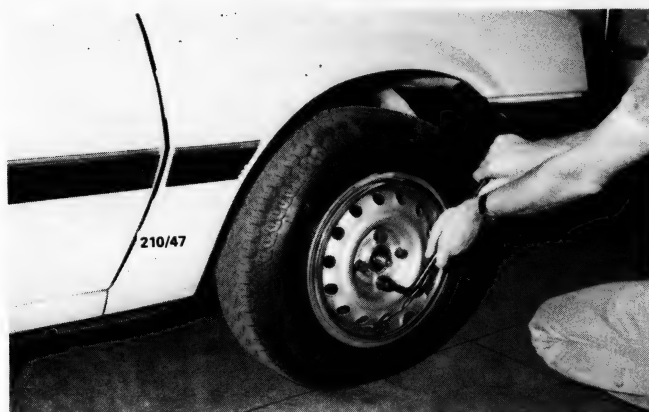
(20) Lower the vehicle to the ground by rotating the jack handle anti-clockwise and remove the jack from under the vehicle.

(21) Using the wheel spanner tighten the wheel bolts in a diagonal sequence. It will be necessary to repeat the above procedure several times until the wheel bolts are securely tightened.

(22) Where fitted, instal the hub cap to the wheel.

(23) On models fitted with wheel trims, remove the wheel trim from the damaged wheel by inserting the bladed section of the wheel spanner between the outer edge of the wheel trim and the wheel*starting diagonally opposite the tyre valve. Lever the wheel trim away from the wheel using the wheel as a levering point. Repeat the procedure at several points around the wheel until the wheel trim is removed from the wheel.

Instal the wheel trim to the wheel just fitted by positioning the wheel trim on the wheel so that the tyre valve



Tighten the wheel bolts in a diagonal sequence using the wheel spanner.

fits into the wheel trim hole. With the palm of the hand, push the wheel trim into position working around the edge of the wheel trim until the wheel trim is positioned securely.

(24) Remove the chocks from the road wheel.

(25) Fit the road wheel, the jack and the wheel spanner to their original position.

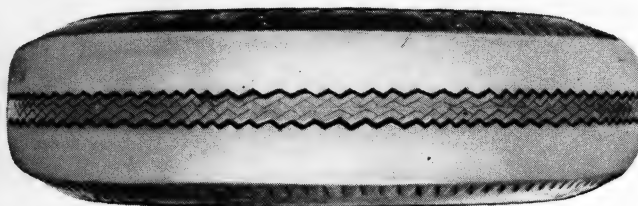
NOTE: Repair the flat tyre or damaged road wheel as soon as possible and check the tyre pressure on the road wheel just installed.

2. TYRE WEAR TROUBLE SHOOTING

ABNORMAL WEAR ON BOTH SIDES OF TREAD

(1) Under inflation of tyres: Check and inflate to recommended pressures.

(2) Overloading: Reduce maximum loading.



ABNORMAL WEAR IN CENTRE OF TREAD

(1) Over inflation of tyres: Check and reduce to recommended pressures.



ABNORMAL WEAR ON INSIDE OF TREAD

Front Tyres

(1) Insufficient camber angle: Check front end alignment.

(2) Sagging front coil springs: Check and renew faulty springs.

(3) Worn front hub bearings: Check and renew front hub bearings.

(4) Loose or worn suspension components: Check and renew faulty components.

(5) Bent steering knuckle: Check and renew front suspension unit.

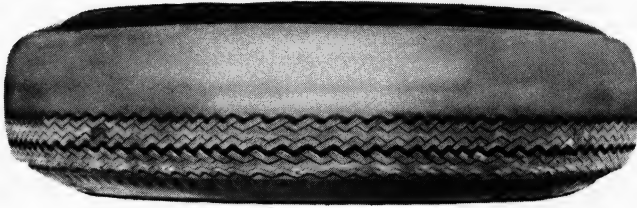
Rear Tyres

(1) Bent stub axle: Check and renew stub axle.

(2) Loose or worn rear axle mounting bushes: Check and renew faulty bushes.

(3) Bent rear axle trailing arm: Check and renew rear axle assembly.

(4) Loose or worn rear hub bearings: Check and adjust or renew hub bearings.



ABNORMAL WEAR ON OUTSIDE OF TREAD

Front Tyres

(1) Excessive camber angle: Check front end alignment.

(2) Incorrect coil springs fitted: Check and instal recommended replacement springs.

(3) Excessive speed when cornering: Revise driving habits.

Rear Tyres

(1) Bent stub axle: Check and renew stub axle.

(2) Bent rear axle trailing arm: Check and renew rear axle assembly.

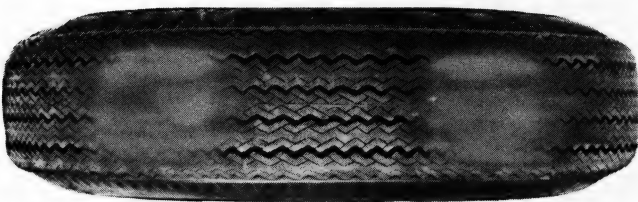
SPOTTY OR IRREGULAR WEAR

(1) Static or dynamic unbalance of wheel and tyre assembly: Check and balance wheel and tyre assembly.

(2) Lateral run out of wheel: Check and true up or renew wheel.

(3) Excessive play in hub bearings: Check and adjust or renew hub bearings.

(4) Excessive play in front suspension ball joints: Check and renew ball joints.



LIGHTLY WORN SPOTS AT CENTRE OF TREAD

(1) Static unbalance of wheel and tyre assembly: Check and balance wheel and tyre assembly.

(2) Radial run out (eccentricity) of wheel: Check and renew wheel.

FLAT SPOTS AT CENTRE OF TREAD

(1) Repeated severe brake application: Revise driving habits.

(2) Lack of tyre rotation: Periodically rotate wheel and tyre assemblies.

HEEL AND TOE WEAR (SAWTOOTH EFFECT)

(1) Overloading: Revise maximum loading.

(2) High speed driving: Avoid as far as possible.

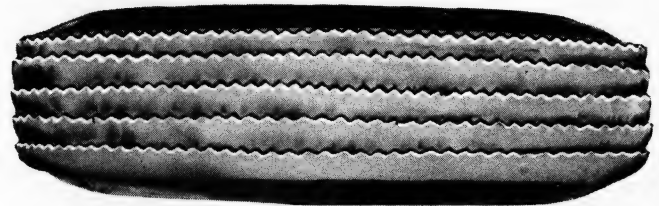
(3) Excessive braking: Revise driving habits.

FEATHERED EDGE ON THE SIDE OF TREAD PATTERN

Front Tyres

(1) Sharp inside edge -excessive toe-in: Check and adjust wheel alignment.

(2) One tyre sharp inside edge, other tyre sharp outside edge: Check for bent steering knuckle or tie rod and renew as necessary.



Rear Tyres

(1) Loose or worn rear axle mounting bushes: Check and renew bushes.

(2) Stub axle bent: Check and renew stub axle.

(3) Rear axle trailing arm bent: Check and renew rear axle assembly.

NOTE: To preserve tyre life it is good policy to periodically have the wheels balanced and the steering geometry checked on a reliable wheel alignment machine. Under no circumstances mix radial ply and conventional ply tyres. Fit only tyres of the same construction to all four wheels.

3. JACKING INFORMATION

When using the jack supplied with the vehicle refer to the owners handbook or to the information label on the jack for correct jacking point locations.

If the vehicle is to be raised with a trolley jack, a 'wheel free' hoist, or supported on chassis stands, it is essential that the correct jacking and support points are used. See illustration. Severe damage could result to the body and/or the suspension if the vehicle is jacked or supported incorrectly.

If the rear of the vehicle is to be lifted on a trolley jack, the jack must be positioned beneath notch A at the rear corner of each body sill panel in turn and a chassis stand placed beneath the sill panel as close as possible to notch A. A hard rubber pad should be interposed between

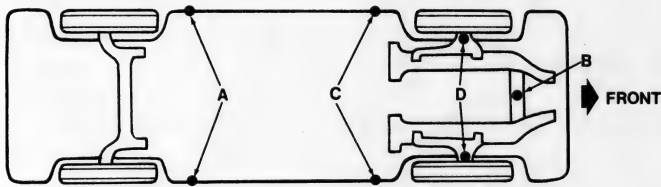


Illustration showing the jacking and support points, see text.

the jack head/chassis stand and the sill panel to prevent damage to the vehicle.

Under no circumstances should a jack be placed under the centre of the rear axle beam in order to raise the vehicle. If for some reason the vehicle must be supported on the rear axle beam, a support fixture using rubber pads at the axle beam contact points should be manufactured to the dimensions shown in the illustration and used between the rear axle beam and the jack or the 'wheel free' hoist.

The front of the vehicle may be raised by placing a trolley jack with a rubber pad on the jack head beneath point B, the centre of the front lower crossmember. Place the chassis stands, using rubber pads, under the notches C

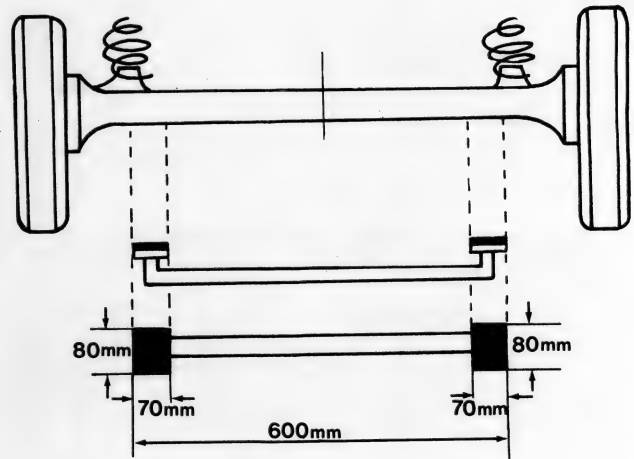


Illustration showing the dimensions for manufacturing a rear axle beam support fixture.

at the front corner sill panels. If the front of the vehicle needs to be supported by the front suspension arms place the chassis stand as close as possible to the suspension arm ball joints, points D.

CAUTION: To prevent severe electrical shock extreme care must be taken when working on or near the electronic ignition system as dangerous high tension voltages are produced in both the primary and secondary circuits. See text for precautionary notes.

1. TUNE-UP SPECIFICATIONS

Firing order 1-3-4-2

Spark plugs:

Type AC-R42XLS

Gap 0.7-0.8 mm

Tightening torque 30 Nm

Ignition timing at curb idle speed 10 deg btdc

* Curb idle speed 850-900 rpm

** Fast idle speed:

Manual transmission 2100 rpm

Automatic transmission 2300 rpm

Idle speed with idle load compensator engaged:

All manual transmission models .. 1350-1400 rpm

Automatic transmission models without air conditioning, in N (Neutral) 1350-1400 rpm

Automatic transmission models with air conditioning (where fitted) switched off in N (Neutral) 1500-1550 rpm

Automatic transmission models with air conditioning (where fitted) switched on and in D (Drive) 775-825 rpm

Drive belt deflection See text

* Curb idle speed is adjusted with the idle load compensator plunger completely withdrawn from the throttle stop lever pad.

** Fast idle speed is adjusted with the fast idle adjusting screw on the second highest step of the fast idle cam.

NOTE: When performing an engine tune-up always compare the previously listed Tune-up Specifications with the emission control information label inside the engine compartment on the right hand side suspension tower.

2. TUNE-UP OPERATIONS

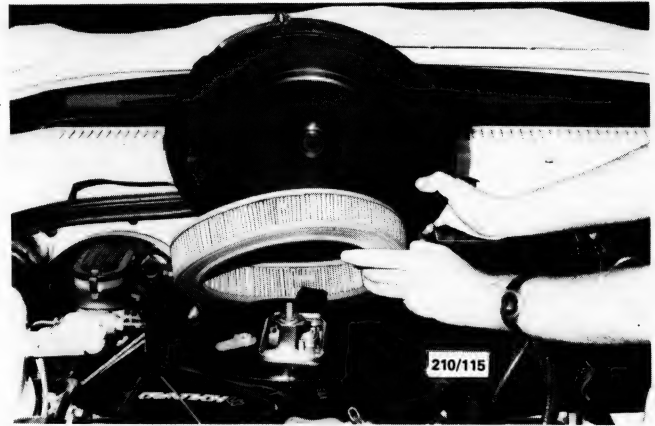
Special Equipment Required:

To Test Compression - Compression gauge

TO SERVICE AIR CLEANER

The air cleaner is fitted with a paper type element. The element should be regularly inspected but should not be cleaned in service.

The element should be renewed at the recommended intervals of 40,000 km. This distance is only a guide for normal operating conditions and should be reduced accordingly if the vehicle is operating under extremely dusty conditions.



The air cleaner should be serviced at regular intervals.

NOTE: Paper air cleaner elements should not be washed in petrol or any other type of cleaning solvent. If the element has been washed in solvent or has become oil soaked then it should be discarded and a new element fitted.

(1) Remove the air cleaner assembly from the engine. If necessary refer to the Fuel System section for correct procedure.

(2) Remove the top cover from the main body and take out the air cleaner element.

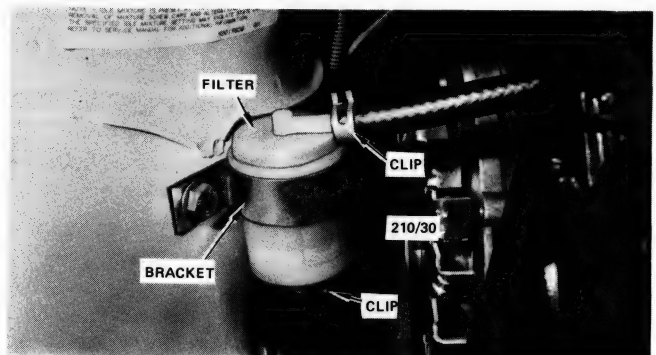
(3) Discard the element as necessary and wipe off any dust accumulation on the main body and top cover.

(4) Place the new element onto the main body and position the assembly on the carburettor.

(5) Fit the top cover and connect up the various hoses to the air cleaner assembly.

TO RENEW FUEL FILTER

NOTE: The fuel filter should be renewed at intervals of 20,000 km.



Installed view of fuel filter.

- (1) Remove the fuel filter bracket retaining bolt and slide the bracket off the filter.
- (2) Release the hose clips on the fuel hoses at the filter.
- (3) Hold a suitable container beneath each hose in turn, pull the hoses from the filter and drain the hoses into the container. If necessary plug the fuel tank hose.
- (4) Slide the hoses onto their respective connections on the new filter and secure with the retaining clips. Slide the bracket onto the filter and instal the retaining bolt.
- (5) Start and run the engine and check for fuel leaks at the filter connections.

TO SERVICE DISTRIBUTOR

The electronic ignition system is maintenance free and permits trouble free operation over an extended period.

Refer to the Electrical System section for Specifications and Trouble Shooting.

NOTE: When working on or near electronic ignition systems care should be taken as dangerous high voltages are present in the primary and secondary circuits.

The ignition switch should be turned off before removing or refitting any electrical connections otherwise damage to the ignition system as well as severe electrical shock could result.

When the distributor cap is removed ensure that the distributor cap clips are clear of the distributor otherwise serious damage to the distributor could result if the engine is turned over.

HOW TO CONNECT ELECTRICAL TEST EQUIPMENT

NOTE: Some types of tachometers, timing lights and ignition system analysers are not compatible with this type of electronic ignition system. It is therefore recommended that the manufacturer of the test equipment should be consulted before proceeding to use the equipment.

Do not allow the tachometer and negative coil lead connectors to short to earth as damage to the test equipment or ignition system may result.

Timing Light

- (1) Connect the timing light to the engine following the instrument manufacturers instructions.

NOTE: Do not connect or disconnect the timing light with the engine running as voltage



Checking the ignition timing using a suitable timing light.

surges could damage the alternator. Do not allow the high tension leads to open circuit as damage to the ignition system could result.

- (2) Where necessary connect the power leads of the timing light to an external power source to prevent possible transient voltages in the timing light damaging the vehicles alternator.

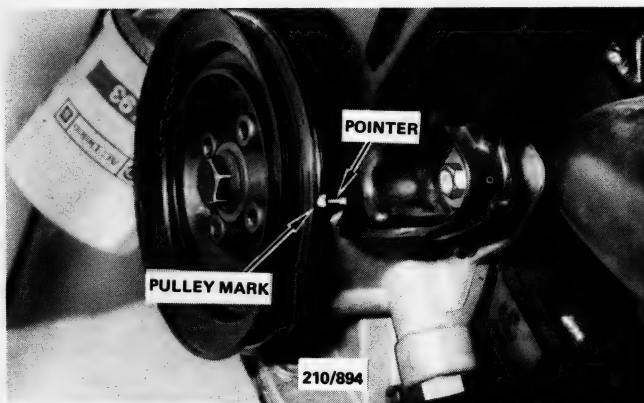
TO ADJUST IGNITION TIMING

- (1) Connect an approved tachometer and timing light to the engine as previously described.
- (2) Start the engine, bring it to normal operating temperature and check the timing position with the timing light at the specified rpm.

Correct timing exists when the mark on the crankshaft pulley is adjacent to the pointer on the oil pump housing.

- (3) If necessary adjust the timing by loosening the distributor body retaining nuts and rotating the distributor body until the correct setting is obtained. Tighten the retaining nuts and recheck the timing.

- (4) After adjusting the ignition timing, reset the idle speed to Specifications as described under the relevant heading, remove the test equipment and connect any detached wires.



View of crankshaft pulley showing timing mark aligned with timing pointer.



Check the high tension leads for perishing or cracking. Also check the lead ends for corrosion and burning.

TO SERVICE HIGH TENSION LEADS

Check the leads for perishing or cracking and renew as required. Never attempt to repair defective carbon impregnated core leads.

The leads may be carefully cleaned, using a cloth moistened with kerosene, then wiping completely dry.

If an ohmmeter is available the electrical resistance of the leads may be checked as follows:

(1) With the distributor cap and leads removed as an assembly, test one lead at a time, connecting the meter probes at the spark plug end of the lead and at the corresponding terminal inside the cap. Resistance should be less than 24,000 ohms per metre.

(2) If the resistance is more than 24,000 ohms per metre, remove the lead from the distributor cap and check the resistance in the lead only. The lead should be renewed if resistance is still more than 24,000 ohms per metre.

(3) High distributor cap resistance may be due to corrosion deposits on the cap terminals. These deposits should be removed with a small scraper or emery cloth.

Check the distributor cap for cracks or tracking between the high tension terminals on both the inside and outside of the cap. Renew the cap if cracks or tracking are evident.



Check the inside of the distributor cap for cracks or tracking.



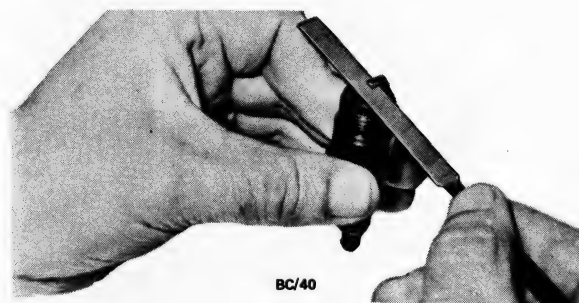
Checking high tension lead resistance.

Check the carbon brush in the centre of the distributor cap for evidence of arcing and renew as necessary.

TO SERVICE SPARK PLUGS

The spark plugs should be renewed at intervals of 20,000 km.

Before removing the spark plugs ensure that the area around each plug is clean to prevent foreign matter entering the cylinder when the plugs are removed.



Lightly file the plug electrodes flat with a points file.

Spark plugs removed from an engine in good mechanical condition should have a light powdery deposit ranging from light brown to greyish tan in colour. After considerable service the electrodes will show signs of wear or normal burning. Spark plugs showing a thick black oily deposit indicate an engine in poor mechanical condition or possibly, that a plug with too low a heat range has been fitted.

Spark plugs showing a white or yellowish deposit indicate sustained high speed driving or possibly, that plugs with too high a heat range have been fitted, particularly when these deposits are accompanied by blistering of the porcelain and burning of the electrodes.

If the spark plugs are to be cleaned use a sand-blasting machine and blow clean with compressed air. Ensure that all traces of abrasive grit are removed from the spark plug threads and from the well in the plug body. Carefully



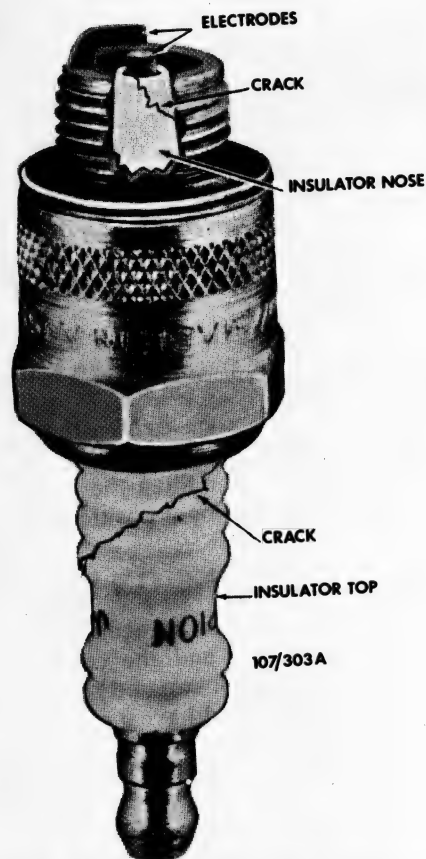
Spark plug with burnt electrodes and white blistered appearance. Possibly due to incorrect plug type, loose plug or motor running too hot.



Black damp deposits can be caused by excessive oil consumption or incorrect plug type. Spark plugs in this condition are usually not firing.



When plug electrodes are eroded to this degree the spark plug can be considered worn out and should be renewed using a spark plug of the recommended heat range.



Cutaway view of spark plug showing crack in insulator nose which can be caused by exerting pressure against the centre electrode when adjusting gap. Other crack shown on insulator is caused by tilting plug spanner.

open the electrode gap a little, by bending the side electrode, and lightly file the electrodes flat with a points file.

NOTE: Never attempt to alter the electrode gap by bending the centre electrode as damage to the porcelain insulator will result.

Before installing any spark plugs measure the gap between the electrodes preferably with clean wire gauges.



Checking spark plug electrode gap with feeler gauge.

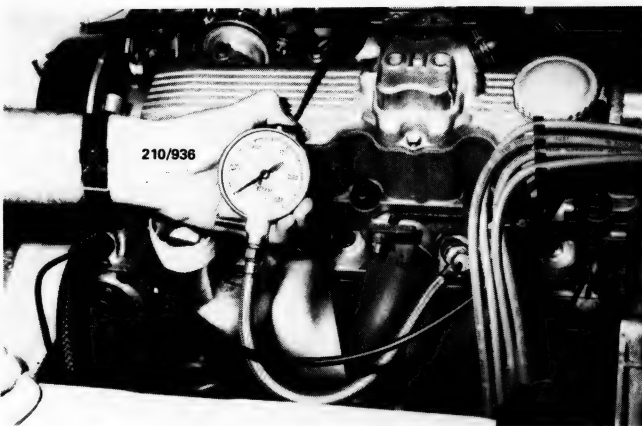
If wire gauges are unavailable then use clean feeler gauges. Move the side electrode towards or away from the centre electrode to obtain the correct gap.

Screw the plugs into the cylinder head finger tight, then use a torque wrench to tighten the plugs to the specified torque.

NOTE: If a torque wrench is unavailable extreme care must be taken when tightening the spark plugs as overtightening may lead to stripping of the thread from the cylinder head. If the plugs are tightened with the fingers and then taken up an additional ¼ of a turn with a spark plug wrench, they will be tight enough.

TO TEST COMPRESSION

- (1) With the engine at operating temperature, disconnect the high tension leads from the spark plugs.
- (2) Ensure that the area around each spark plug is clean to prevent foreign matter entering the cylinders and then remove the spark plugs.
- (3) Isolate the ignition by removing the low tension lead from the coil positive terminal.
- (4) Apply a compression gauge to number one spark plug hole according to the manufacturers instructions of the instrument being used.



Checking the cylinder compression using a compression gauge.

- (5) Have an assistant fully open the throttle and operate the starter switch to rotate the engine. Observe the compression gauge and stop the engine when the gauge has reached the highest reading.
- (6) Record the reading and then check the compression of the remaining cylinders in the same manner.
- (7) Compare all readings taken. Variation between highest and lowest reading cylinders should not exceed 100 kPa.
- (8) If a low reading is taken on one or more cylinders the trouble may be isolated as follows:
 - (a) Inject a small amount of engine oil into the spark plug hole of the cylinder concerned ensuring that the oil is evenly distributed within the cylinder.

- (b) Repeat the compression test on the cylinder concerned.

A substantial increase of compression pressure indicates faulty or worn piston rings, pistons or cylinder. No increase of compression pressure indicates burnt, obstructed or sticking valves, or a leaking or blown head gasket.

TO ADJUST IDLE SPEED

NOTE: Before adjusting the idle speed ensure the following conditions are met:

The air cleaner element is clean and installed.

The throttle cable is correctly adjusted.

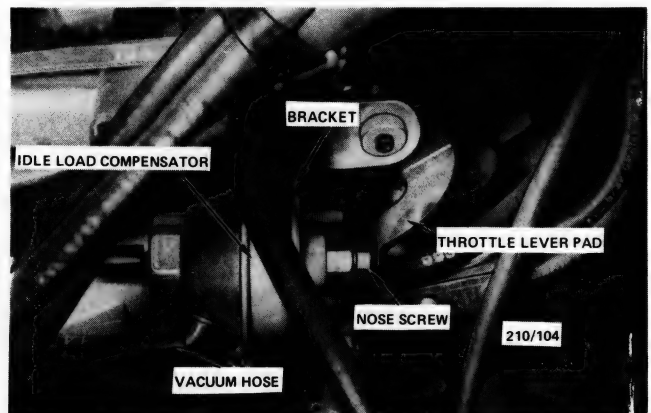
The ignition timing is correctly set and the spark plugs correctly gapped.

The choke valve is fully open and the air conditioning, if fitted, is switched off.

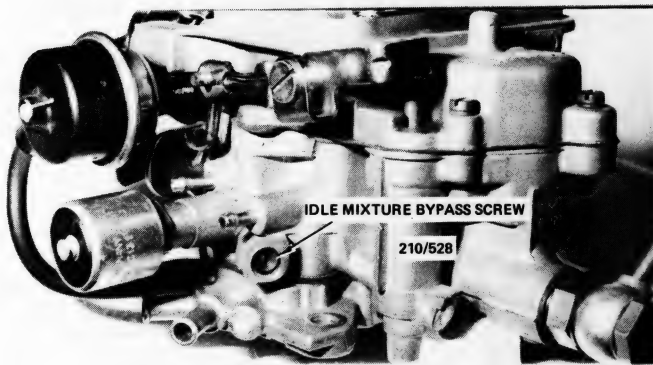


Checking the engine idle speed using a tachometer.

- (1) Firmly apply the handbrake and select P (Park) on vehicles with automatic transmission.
- (2) Connect an approved tachometer to the engine as per manufacturers instructions and disconnect and plug the vacuum hoses from the distributor advance unit and from the idle load compensator.
- (3) On vehicles with automatic transmission ensure the kickdown cable is correctly adjusted.



Installed view of idle load compensator.



View showing idle mixture bypass adjusting screw.

(4) Loosen the nuts securing the idle load compensator to the carburettor bracket and move the idle load compensator away from the carburettor throttle lever pad.

(5) Start and run the engine until it reaches normal operating temperature.

(6) After the engine has reached normal operating temperature check and if necessary adjust the curb idle speed to Specifications by turning the mixture bypass screw.

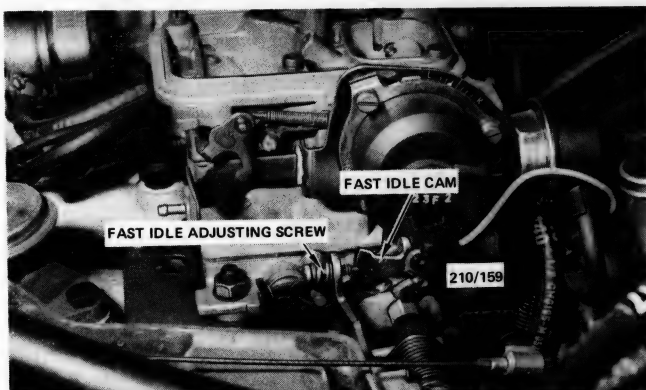
(7) Stop the engine, open the throttle slightly and move the fast idle cam so that when the throttle is released the fast idle screw will rest on the second highest step of the fast idle cam.

(8) Start the engine, without touching the throttle, check and adjust the fast idle speed, if necessary, to Specifications by turning the fast idle adjusting screw. Ensure that the adjusting screw does not slip off the second highest step of the cam while carrying out the adjustment.

(9) Rev the engine slightly to release the fast idle adjusting screw from the fast idle cam.

(10) After adjustment of the fast idle speed has been completed, tighten the idle load compensator retaining nuts and connect the vacuum hose to the idle load compensator.

(11) Rev the engine slightly to engage the idle load compensator and on vehicles fitted with automatic transmission place the transmission in N (Neutral).



View of fast idle adjusting screw resting on second highest step of fast idle cam.

(12) Check and adjust the idle speed to Specifications by turning the nose screw on the idle load compensator.

(13) On vehicles with automatic transmission and air conditioning, check the loaded idle speed by selecting D (Drive) and switching the air conditioning on. Again check the idle speed with Specifications.

NOTE: If satisfactory loaded or unloaded idle speeds can not be obtained by adjusting the idle load compensator nose screw, the idle load compensator or the idle load compensator internal preload adjustment may be suspect. As special equipment is required to check and adjust the idle load compensator it is therefore advised to refer the problem to an authorised dealer or to a competent carburettor specialist.

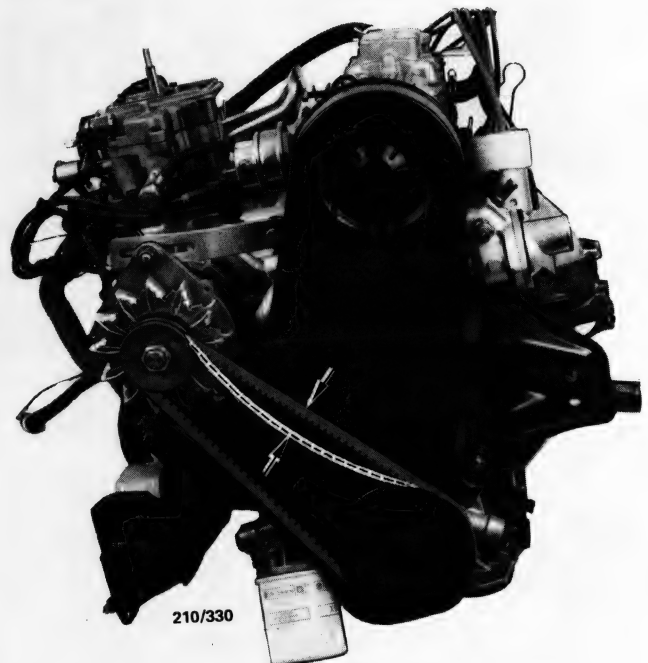
(14) Stop the engine, disconnect and remove the tachometer from the engine and instal the vacuum hose to the distributor.

TO ADJUST DRIVE BELTS

It is essential that all belts be adjusted to prevent slip but without imposing excessively upon the component bearings, particularly the alternator bearings.

The drive belts should be adjusted using the following procedure:

(1) Using finger and thumb pressure push firmly on the belt concerned in the middle of the longest run to assess deflection.



Front view of engine. Arrows show the correct drive belt deflection checking point.

(2) Drive belts with a longest run of less than 300 mm should have a deflection of between 3 and 6 mm, whereas drive belts with a longest run of more than 300 mm should have a deflection of between 3 and 13 mm.

(3) If necessary loosen the accessory pivot and ad-

justing bolts and move the accessory in the adjustment slot provided to achieve the correct drive belt tension.

(4) When the correct belt tension is obtained tighten the accessory pivot and adjusting bolts securely and recheck the belt tension.

CAUTION: *To prevent severe electrical shock extreme care must be taken when working on or near the electronic ignition system as dangerous high tension voltages are produced in both the primary and secondary circuits. See text for precautionary notes.*

This section deals with the common causes of engine failure to start, as inevitably there will come a time when every driver will experience this problem and will therefore, need to call upon his own resources to rectify the trouble. Roadside breakdowns other than engine failure can be identified by reference to the Trouble Shooting section on the particular component affected.

1. TROUBLE SHOOTING

Trouble shooting is only a process of elimination and provided the procedure is carried out correctly and systematically an accurate diagnosis of the trouble can be made in the minimum amount of time.

For an internal combustion engine to run there are three basic requirements, these are ignition, fuel and compression. There are other factors of course but as a rule an engine's failure to start can be attributed to a fault in one of these three systems.

Reports from field engineers of motoring organisations prove that the biggest percentage of engine breakdowns are in the order of ignition or electrical failure first, followed by fuel, with mechanical or compression failure the least common.

Should the engine fail to start, first check that there is adequate fuel in the tank and if so, carry out the following checking procedures in the order described.

2. TO CHECK IGNITION AND ELECTRICAL SYSTEMS

(1) Switch on the ignition and check for warning lamp illumination on the dashboard.

(2) Operate the starter and check that the starter rotates the engine at a steady speed.

(3) Switch on the headlamps and check for good light intensity.

Should the lamps not illuminate or the starter motor not turn the engine, carry out the following steps:

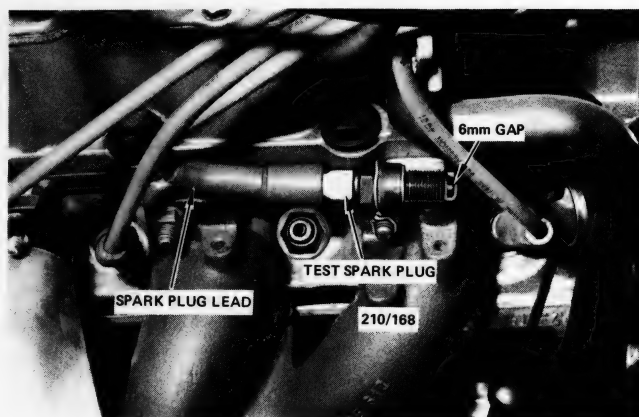
(a) Remove the battery terminals and clean both terminals and posts. Refit the terminals and where applicable tighten firmly but not excessively.

(b) Check that the earth lead from the battery to the engine or body frame is not broken and that the connections are clean and secure.

(c) Check that the lead from the battery to the starter motor or starter solenoid is intact and has a clean and secure connection.

(d) Where necessary carry out repairs to (b) and (c).

Again carry out the check procedure, should the starter motor still not operate, or the lamps not illumi-



Securely earth the body of a test spark plug and check for sparks at the spark plug.

nate, then one or more of the following faults may be the cause:

No starter motor operation or lamps: Battery flat or defective.

Lamps illuminate but no starter operation. Starter motor drive jammed in mesh with flywheel ring gear. Starter motor or solenoid defective. Ignition/starter switch faulty. On automatic transmission models, faulty neutral safety switch.

Lamps dim and starter operation sluggish: Discharged battery or fault in starter motor. Battery flat due to broken fan belt or defective alternator. Faulty battery due to cell breakdown.

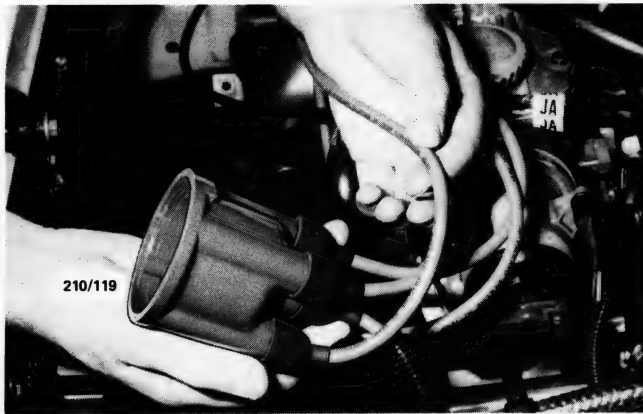
If the battery and starter motor operation proves satisfactory but the engine still fails to start, continue as follows:

(1) Open the electrode gap on an old serviceable spark plug to 6 mm. Securely earth the body of this spark plug using a jumper lead or by tying the plug to an earthed engine component. Remove a spark plug lead and connect it to the test plug.

NOTE: *When working on or near electronic ignition systems care should be taken as high voltages are present in the primary and secondary circuits which could result in severe electrical shocks.*

The ignition switch should be turned off before removing or refitting any electrical connections, otherwise damage to the ignition system as well as severe electrical shock could result.

When the distributor cap is removed ensure that the distributor cap clips are clear of



Check the high tension leads for perishing or cracking. Also check the cable ends for corrosion.

the distributor otherwise serious damage to the distributor could result if the starter is operated.

- (2) Have an assistant operate the starter motor.
- (3) Check that a spark, if any, jumps the gap on the test spark plug. If there is no spark, carry on with point (4). If the spark is satisfactory proceed to point (5).
- (4) Disconnect the coil lead from the distributor cap and connect it to the test spark plug. Carry out the check procedure previously described for the spark plug leads in points (2) to (3). If there is a strong blue spark then the fault lies within the distributor cap, rotor arm or spark plug leads.

Should there be no spark on both or either tests turn the ignition off then carry out the following checks:

- (a) Check the spark plug leads to ensure that they are perfectly dry and that the insulation is not cracked.
- (b) Check the distributor cap to ensure that it is dry and clean. Examine both inside and outside of the cap for cracks or tracking, particularly between the spark plug segments in the cap.
- (c) Check the rotor arm for cracks, deposits and burning on the metal arm.
- (d) Ensure that the spark plug leads and the coil



Check the inside of the distributor cap for cracks or tracking.

lead have dry, clean and secure connections in the distributor cap.

(e) Check that the carbon brush in the centre of the distributor cap interior face is clean and dry and ensure that the carbon brush moves freely in and out of its locating hole.

(f) Check that the low tension wires on the ignition coil are intact and have clean and secure connections.

NOTE: Do not carry out any further tests on electronic ignition systems as the primary and secondary circuit can produce dangerous high tension voltages. Refer to the Electrical System section for correct testing procedure.

(5) If the above checks prove the spark to be satisfactory but the engine still fails to start, remove all spark plugs and check their condition and electrode gap against the information given in the Engine Tune-up section under the appropriate heading.

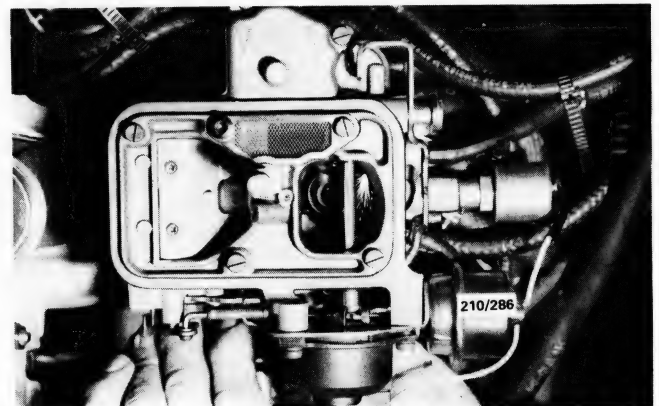
3. TO CHECK THE FUEL SYSTEM

(1) Assuming that the fuel tank does contain a quantity of clean fuel, the first test is to determine if there is fuel in the carburettor float chamber. To do this first remove the air cleaner from the carburettor and with the choke valve open look down the carburettor throat. While looking down the carburettor throat, open and close the throttle several times by actuating the throttle linkage by hand. If squirts of fuel are seen to discharge from the accelerator pump discharge nozzle, it is an indication that the carburettor float chamber is full of fuel and that the fuel system is functioning OK.

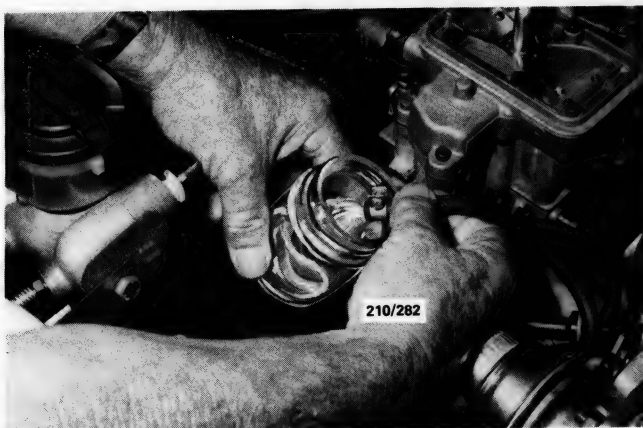
If on the other hand no fuel was being discharged from the accelerator pump nozzle then proceed checking as follows:

(2) Disconnect the low tension wire at the + coil terminal to prevent the engine from possibly starting during the next part of the test.

(3) Disconnect the fuel supply line at the carburettor and position the end in a suitable container. Have an



Check for discharge of fuel at accelerator pump discharge nozzle by actuating the throttle quickly by hand.



Checking for fuel flow at carburettor fuel supply line.

assistant operate the starter and note if fuel is being discharged into the container. Proceed to point (7) if fuel flow is satisfactory, if not, continue with points (4) to (6).

(4) Disconnect the fuel supply line from the tank to the inlet side of the fuel pump.

(5) Remove the fuel tank filler cap and have an assistant listen at the tank filler aperture. Blow down through the fuel line towards the tank and provided the line is clear, air bubbles will be heard in the tank.

(6) Reconnect the fuel pipe to the pump and again check for fuel delivery from the fuel pump.

If there is no delivery of fuel to the carburettor side of the fuel pump then one or more of the following faults may be the cause:

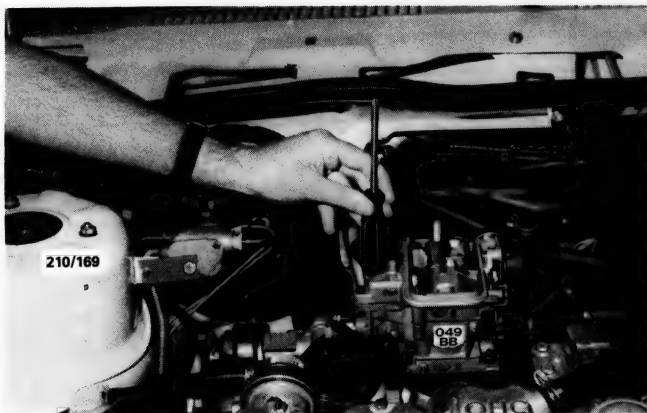
No air bubbles heard on tank test: Pipe obstructed or fractured. Blocked fuel filter.

Air bubbles heard in tank but no delivery from the fuel pump: Faulty fuel pump.

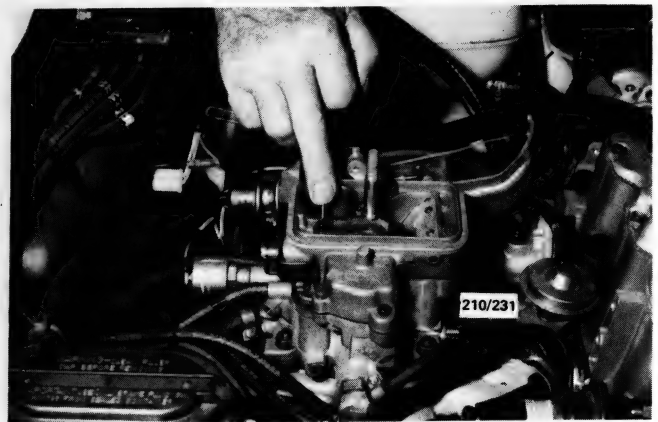
Refer to the appropriate heading in the Fuel System section for fuel pump test procedure.

(7) Should there be a satisfactory supply of fuel at the carburettor end of the fuel pipe but the engine will still not start, carry out the following additional procedure:

(a) First check that flooding is not the cause due to



Float chamber flooding can sometimes be rectified by tapping the carburettor in the vicinity of the needle valve.



When the engine is at operating temperature the choke valve should be fully open.

excessive use of the accelerator when attempting to start the engine or a faulty automatic choke.

Remove the spark plugs and check for petrol saturation of the electrodes, if evident thoroughly clean and dry before replacement.

(b) If flooding persists, check the float and needle valve for sticking and also ensure that the float is not punctured allowing it to fill with fuel.

(c) Check the air filter for choked filter element.

If flooding is not the cause and there is an adequate supply of fuel to the carburettor, one or more of the following faults may be the cause:

Where fitted, blocked carburettor filter.

Stuck or obstructed needle valve.

Choke valve not operating correctly.

Air leaks around the inlet manifold or carburettor mounting flanges because of distortion or defective gaskets.

Fractured hose or loose connections between the brake servo unit and the inlet manifold.

4. TO CHECK THE MECHANICAL SYSTEM

The following check procedure assumes that the starter motor will rotate the engine, if not, on manual transmission models press in the clutch to disengage the engine from the transmission in case the fault lies within the transmission. If the starter will still not rotate the engine it will be necessary to remove the starter motor and attempt to turn the engine over manually. This will establish whether the fault lies with the starter motor which could be jammed or defective, or the engine which could be seized or have broken internal components such as connecting rods, pistons and crankshaft etc. If the starter motor is not at fault and the engine will not rotate manually then refer to the heading Engine Mechanical Trouble Shooting in the Engine section.

It should be noted that the only way that compression can be accurately tested is by means of a compression

gauge. The crude method described in the following check procedure is only intended to give a rule of thumb indication when checking for causes of engine breakdown.

(1) Check for loss of water from the surge tank. If so, check carefully for any indication of external leakage and, remove the engine oil dipstick and check for emulsification of the oil. When water mixes with oil it will turn creamy and the oil level will also have increased. If the oil is emulsified the following checks are not required.

(2) Isolate the ignition by disconnecting the low tension wire at the + coil terminal. Remove each of the spark plugs in turn and firmly block the spark plug hole in the cylinder head with the pad of the thumb. Have an assistant fully open the throttle and operate the starter switch to rotate the engine, check that the compression is strong enough to force past the thumb sealing the plug hole and also examine the thumb and the spark plug previously removed for indications of water.

If the above checks show a loss of water and this is present in the engine oil or on the thumb or spark plug, then one or more of the following faults may be the cause:

Blown cylinder head gasket.

Cracked cylinder or cylinder head.

Warped cylinder head and/or cylinder block faces.

If the crude compression check showed any weak, lack of or inconsistent compressions, then any of the above faults could also be the cause plus the following:

Broken piston(s)

Burnt or broken valves.

Provided the previous checks do not indicate an internal leakage of water continue with the following:

(3) Remove the distributor cap and, with an assistant operating the starter switch, check that the rotor arm rotates as the engine turns over.

NOTE: When the distributor cap is removed ensure that the distributor cap clips are held clear of the distributor otherwise serious damage to the distributor could result when the starter is operated.

(4) Remove the camshaft housing cover and, again with an assistant operating the starter switch, check that all the valves open and close as the engine turns over.

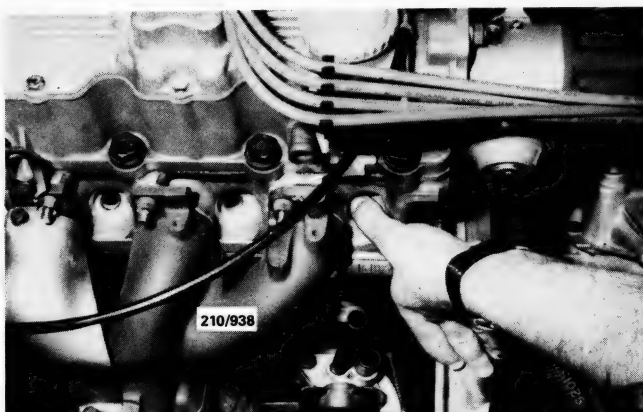
If the rotor arm or the valves do not operate with engine rotation then one of the following faults may be the cause:

Rotor arm does not turn but valves operate: Distributor drive shaft or drive coupling broken.

Rotor arm and valves do not operate: Broken drive belt or worn or damaged teeth. Sheared crankshaft timing gear drive key. Sheared camshaft timing gear drive dowel.

Provided all the previous checks have been carried out correctly and the operator is quite satisfied that none of the components are at fault then all that remains is for the ignition and valve timing to be checked. It should be noted however, that if loss of valve timing proves to be the fault then the cause of this occurrence must be sought and rectified.

NOTE: In order to check the ignition and valve timing it will be necessary to remove the distributor cap and camshaft housing cover and turn the engine clockwise via the crankshaft pulley until No. 1 piston is at tdc on the compression stroke. In this position the valves of No.4 cylinder should be "rocking" and the distributor rotor should be pointing to the No. 1 high tension lead segment in the distributor cap.



Rule of thumb method of checking cylinder compression.



Check the engine oil for correct level and for dilution on the dipstick.

SPECIFICATIONS

ENGINE ASSEMBLY

Type	4 cyl in line OHC
Firing order	1-3-4-2
Compression ratio	8.5:1
Bore	79.945-80.105 mm
Stroke	79.5 mm
Capacity	1,598 cc

NOTE: Specifications regarding engine tuning are listed in the Engine Tune-up section.

CYLINDER BLOCK

Type	4 cyl in line integral with crankcase
Material	Cast iron
Bore ovality limit (standard)	0.013 mm
Bore taper limit (standard)	0.013 mm
Bore wear limit	0.1 mm
Block face distortion limit	0.1 mm
Maximum height of piston above block face at top dead centre	0.33 mm

CYLINDER HEAD

Type	One piece, crossflow
Material	Aluminium alloy
Distortion limit	0.1 mm
Machining limit	0.25 mm
Minimum overall height, after machining ...	95.5 mm
Valve seat angle	45 degrees

Valve seat contact width:

Inlet	1.3-1.4 mm
Exhaust	1.7-1.8 mm

VALVES AND SPRINGS

Valve length	106.5 mm
--------------------	----------

Valve head diameter:

Inlet	35.0 mm
Exhaust	32.0 mm

Valve stem diameter:

Inlet	7.975-7.985 mm
Exhaust	7.957-7.970 mm

Valve stem to guide clearance:

Inlet	0.015-0.042 mm
Exhaust	0.03-0.06 mm

Valve face angle	44 degrees
------------------------	------------

Valve spring tension:

Closed	368N at 36.5 mm
Open	784N at 25.0 mm

TAPPETS

Type	Hydraulic
------------	-----------

Operating length	63.26 mm
Diameter	21.392-21.405 mm

PISTONS AND GUDGEON PINS

Piston type	Cast aluminium alloy, dished crown with valve reliefs
Diameter	79.935-80.095 mm

Piston to bore clearance limits (standard):

* Top ring land	0.615-0.665 mm
** Skirt	0.02-0.04 mm

Gudgeon pin length	70.0 mm
--------------------------	---------

Gudgeon pin diameter	22.989-22.998 mm
----------------------------	------------------

Gudgeon pin clearance in piston	0.005-0.011 mm
--------------------------------------	----------------

Gudgeon pin offset in piston	0.8 mm towards RH side of engine
-----------------------------------	----------------------------------

* Measured at the top of the piston.

** Measured 10.5 mm from the bottom of the piston skirt.

PISTON RINGS

Rings per piston:

Compression	2
Oil control	1

End gap:

Compression	0.3-0.5 mm
Oil control	0.4-1.4 mm

CONNECTING RODS AND BEARINGS

Connecting rod:

* Weight	724-772 grams
End float	0.07-0.24 mm

Crankpin bearing oil clearance	0.019-0.063 mm
-------------------------------------	----------------

* Variation between connecting rod weights must not exceed 8 grams.

CRANKSHAFT AND MAIN BEARINGS

Number of bearings	5
--------------------------	---

End float taken at	No 3 main bearing
--------------------------	-------------------

End float	0.070-0.302 mm
-----------------	----------------

Bend limit	0.03 mm
------------------	---------

Main bearing oil clearance	0.015-0.040 mm
----------------------------------	----------------

Main bearing journal diameter ...	57.995-57.982 mm
-----------------------------------	------------------

Crankpin diameter	48.971-48.987 mm
-------------------------	------------------

FLYWHEEL

Ring gear run out limit	0.5 mm
-------------------------------	--------

Clutch face regrind limit	0.3 mm
---------------------------------	--------

CAMSHAFT

Drive	Toothed belt
-------------	--------------

End float	0.04-0.14 mm
-----------------	--------------

Bend limit	0.03 mm
------------------	---------

Bearings	Direct in housing
----------------	-------------------

Journal diameter:	
Standard	42.455–42.470 mm
	42.705–42.720 mm
	42.955–42.970 mm
	43.205–43.220 mm
	43.455–43.470 mm
Undersize	42.355–42.370 mm
	42.605–42.620 mm
	42.855–42.880 mm
	43.105–43.120 mm
	43.355–43.370 mm

An undersize camshaft can be identified by a violet flash between the inlet and exhaust lobes of No. 2 cylinder.

Housing diameter:	
Standard	42.500–42.525 mm
	42.750–42.775 mm
	43.000–43.025 mm
	43.250–43.275 mm
	43.500–43.525 mm
Undersize	42.400–42.425 mm
	42.650–42.675 mm
	42.900–42.925 mm
	43.150–43.175 mm
	43.400–43.425 mm

An undersize camshaft housing can be identified by a violet flash on the centre camshaft bearing support.

LUBRICATION

Type	Full pressure
Filter type	Full flow disposable
Oil pump rotor to cover plate clearance ..	0.03–0.1 mm
Rotor teeth backlash	0.1–0.2 mm

TORQUE WRENCH SETTINGS

Exhaust manifold nuts	22 Nm
Exhaust manifold flange nuts	22 Nm
Inlet manifold nuts	22 Nm
Camshaft timing gear bolt	75 Nm + 60 degrees
Camshaft retaining plate bolts	10 Nm

Cylinder head bolts:	
Initial torque	25 Nm
1st stage	+ 60 degrees
2nd stage	+ 60 degrees
3rd stage	+ 60 degrees
Warm engine to operating temperature and retighten a further	30–50 degrees

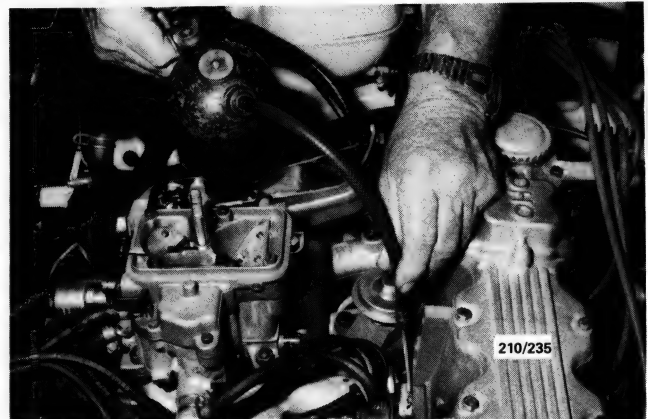
Main bearing bolts	80 Nm
Connecting rod bearing cap nuts	50 Nm
Crankshaft timing gear bolt ...	145 Nm + 35 degrees
Flywheel/drive plate bolts	60 Nm
Water pump bolts	30 Nm
Oil pump cover plate screws	10 Nm
Oil pump mounting bolts	10 Nm
Oil pump pick up pipe bolts	10 Nm
Sump drain plug	40 Nm
Thermostat housing bolts	20 Nm

1. ENGINE MECHANICAL TROUBLE SHOOTING

ENGINE MISSES AT IDLING SPEED

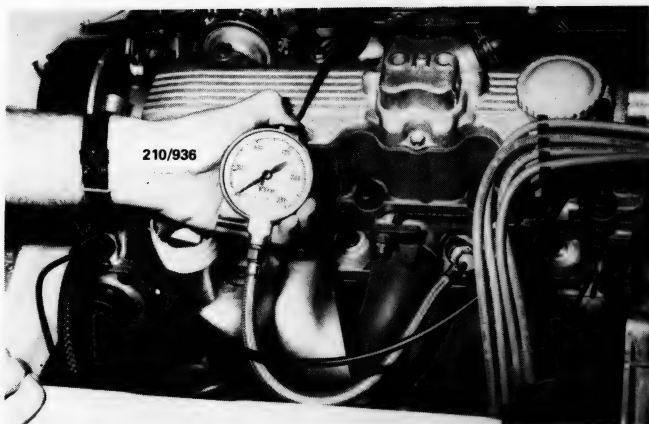
NOTE: For other causes of engine misfire first see Electrical and Fuel sections.

- (1) Blown head gasket: Check cylinder compressions and renew head gasket as necessary.
- (2) Burnt valves or seats in cylinder head: Check cylinder compressions and overhaul head as necessary.
- (3) Broken or worn piston rings: Check cylinder compressions and renew piston rings as necessary.
- (4) Weak or broken valve springs: Remove camshaft top cover and check condition of valve springs.
- (5) Air leak at inlet manifold gaskets: Check for air leak by applying oil around the manifold joints. Renew gaskets if air leak is evident.



Air leaks at the inlet manifold can be located by running engine oil around the suspect joints.

NOTE: Use a compression tester to check the mean effective pressure in each cylinder. This should be done with the engine at normal operating temperature and with the throttle in the wide open position. Note the readings obtained and if variation between cylinders is more than 10 percent, add a small quantity of clean engine oil to each cylinder via the spark plug hole and crank the engine for two or three seconds with the starter motor. Retest the compressions and compare the readings with those obtained on the first test. If any cylinder that gave a low reading on the first test shows a substantial increase in compression on the second test, broken or worn piston rings are indicated. Little or no increase in the second test indicates a burnt valve. If two adjacent cylinders show lower readings than the others, a blown head gasket is indicated. Sticking or obstructed valves may also cause low or uneven compression pressure figures.



Checking the cylinder compression using a compression gauge.

If necessary remove the cylinder head for gasket and valves inspection, or inspect the cylinder bores, pistons and rings, as indicated by the compression test.

NOISY VALVE OPERATION

- (1) Faulty hydraulic tappets: Renew faulty tappet assemblies.
- (2) Weak or broken valve springs: Remove camshaft top cover and check condition of valve springs.
- (3) Worn valve guides: Overhaul the cylinder head as described in this section.
- (4) Worn rocker gear: Remove rocker arms and check components for wear.
- (5) Faulty hydraulic tappet oil pressure relief valve: Renew oil pressure relief valve, see Cylinder Head heading.

BIG END BEARING NOISE

- (1) Lack of adequate oil supply: Check oil level in sump and check condition of oil pump and relief valve. Renew oil filter.
- (2) Excessive bearing clearance: Renew bearing shells, check and regrind big end journals if worn.
- (3) Thin oil or oil diluted by petrol or water: Change to correct oil grade. Check for source of oil dilution and rectify.
- (4) Low oil pressure: Check pressure relief valve and spring, oil filter by-pass valve.
- (5) Misaligned big end bearings: Align connecting rods and renew big end bearings, if necessary.

NOTE: Big end bearing noise is indicated by a metallic knock which is usually loudest at approximately 60 kph with the throttle closed. The knock can be reduced or even eliminated by shorting out the spark plug on the offending cylinder. Before dismantling the engine to inspect the big ends check the engine oil for correct level and dilution on the dipstick. Also

remove the oil pressure sender unit and connect an oil pressure gauge into the oil gallery to check out the oil pressure readings.

MAIN BEARING NOISE (APPARENT)

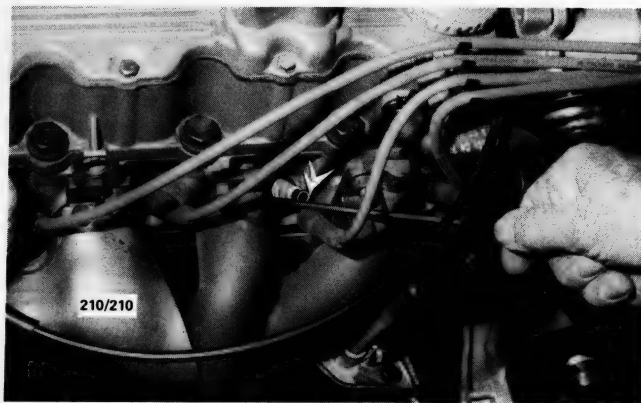
- (1) Loose flywheel: Tighten flywheel securing bolts to specified torque.
- (2) Low oil pressure: Check bearing to journal clearance, check condition of oil pump and pressure relief valve. Recondition oil pump as necessary.
- (3) Excessive crankshaft end play: Renew main bearings.
- (4) Crankshaft journals out of round and excessive bearing to journal clearance: Regrind journals and renew bearings (undersize).
- (5) Insufficient oil supply: Replenish oil in sump to correct level.

NOTE: Main bearing noise is indicated by a heavy but dull knock when the engine is under load. The knock can be confirmed by shorting out the spark plug adjacent to the offending bearing. The knock will be less audible or will even disappear when the plug is shorted. This test is best done with the engine running at fast idle.

A loose flywheel is indicated by a thud or dull click when the ignition is turned off. It is usually accompanied by vibration.

Crankshaft end play noise is indicated by a sharp rap at idle speed. The crankshaft can be readily checked out for excessive end float by levering the crankshaft backwards and forward.

If the oil pressure checks out OK remove the main bearing caps and assess bearing clearance using the Plastigage method as outlined in this section. Ovality and wear on the main bearing journals can only be checked with a micrometer after the crankshaft has been removed.



Shorting out plug lead to test for main bearing noise. Note the use of a split pin to extend the recessed terminal.

EXCESSIVE OIL CONSUMPTION

- (1) Oil leaks: Check and renew engine gaskets or seals as necessary.
- (2) Damaged or worn valve stem oil seals: Dismantle cylinder head and renew damaged or worn oil seals.
- (3) Excessive clearance, valve stem to valve guide: Renew valve guides and/or valves.
- (4) Worn or broken rings: Renew piston rings on all pistons.
- (5) Rings too tight or stuck in grooves: Renew piston rings and clean out ring grooves.
- (6) Excessive wear in cylinders, pistons and rings: Recondition cylinders and renew pistons and rings.
- (7) Compression rings incorrectly installed. Oil rings clogged or broken: Renew piston rings.



Run the engine over white paper to check for oil leaks.

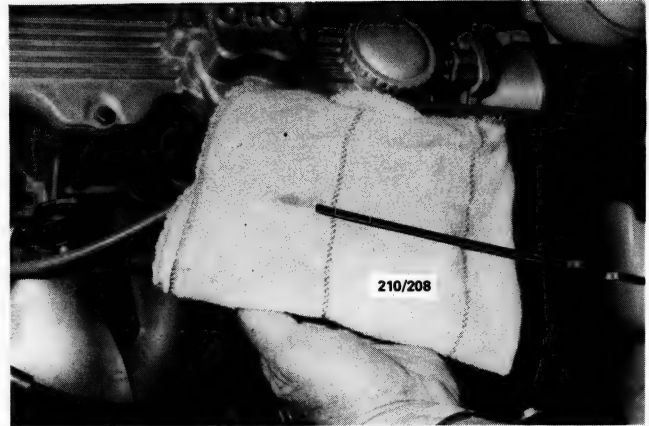
NOTE: Before checking the engine for oil leaks the engine should be completely de-greased and cleaned. Run the engine at operating temperature for a period and then visually check for oil leakage. By placing white paper on the floor directly beneath the engine any excessive leak can be readily pinpointed.

Damaged or worn valve stem oil seals which allow oil to be drawn down past the valve stems into the combustion chambers can be diagnosed by allowing the engine to idle for a few minutes and then opening the throttle. If oil is being drawn down past the valve stems a heavy discharge of blue smoke will be seen at the tail pipe.

Piston, rings and cylinder bore troubles are usually accompanied by a loss of compression. Cylinder compression can only be accurately assessed by using a compression gauge.

DROP IN OIL PRESSURE

- (1) Oil level low in sump: Check and replenish oil to full mark in sump.
- (2) Thin or diluted oil: Change to correct oil grade and rectify source of dilution.



Check the engine oil for correct level and for dilution on the dipstick.

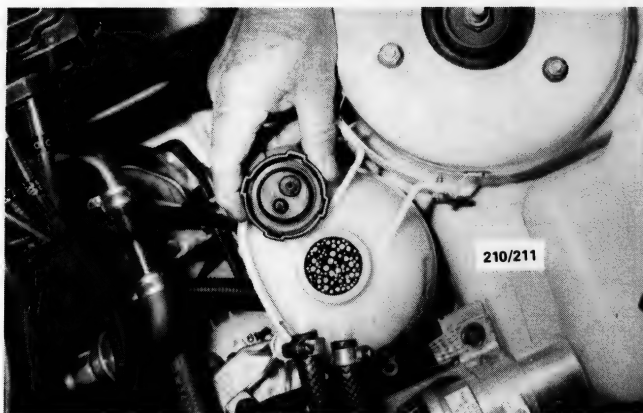
- (3) Oil pump relief valve stuck or spring broken: Free up relief valve or renew broken relief valve spring.
- (4) Excessive bearing clearance: Renew bearing shells or recondition crankshaft journals as necessary.
- (5) Excessive wear of oil pump components: Renew or recondition oil pump.

NOTE: If the vehicle is not fitted with an oil pressure gauge remove the oil sender unit and connect a pressure gauge into the oil gallery. Check the oil pressure with the engine cold and hot. If the oil pump or relief valve are faulty low pressure will be indicated with the engine both hot and cold. However if the bearings are at fault a fairly high pressure will be indicated when the engine is cold but a marked fall of pressure will be noted when the engine is hot.

ENGINE WILL NOT ROTATE

- (1) Starter motor drive jammed: Remove starter motor, check and renew damaged drive and/or flywheel ring gear.
- (2) Engine overheated and seized: Remove and dismantle engine, check and renew damaged components. See following note.
- (3) Water in cylinder due to blown head gasket or cracked cylinder or head: Remove cylinder head, if gasket is blown check for cylinder block and head warp, reface if necessary. Renew cylinder head and/or cylinder block if cracked.
- (4) Broken crankshaft, connecting rod, piston, etc. due to overheating, fatigue, etc: Remove and dismantle engine, examine and renew components as necessary.
- (5) Valve head broken off due to overheating, fatigue, etc: Remove cylinder head, check head, piston and cylinder for damage and repair or renew as necessary.

NOTE: Frequent jamming of the starter motor drive with the flywheel ring gear can be



A blown head gasket is indicated by bubbles in the surge tank coolant.

due to a bent starter armature shaft, damaged teeth on the drive and/or ring gear. With the starter motor removed the flywheel ring gear teeth can be examined through the starter motor mounting aperture. Replacement of the ring gear requires removal of the clutch and flywheel on manual transmission models. The checking for a bent armature shaft can be done by rotating the shaft by hand while the end is held in the close proximity to a fixed object.

Invariably when an engine seizes, because of overheating due to lack of oil and/or water, damage is done to the bearings, pistons, etc. Although there may be instances where an engine will restart and run after it has cooled down and the oil and water replenished, it will generally be found that oil consumption increases, oil pressure drops and the engine will be noisier, depending upon the degree of damage.

When a cylinder head gasket blows allowing water into the cylinders, or compression loss between cylinders, it is essential to check the gasket faces on the cylinder block and head for warp. Sufficient water can enter a cylinder because of a blown gasket, cracked cylinder or head to prevent an engine from rotating, normally this is preceded by difficult starting, misfiring, excessive steam from the exhaust and loss of water from the cooling system. By removing the surge tank cap and allowing the engine to fast idle, bubbles may be seen in the surge tank or alternatively, with the surge tank cap on, excessive discharge from the surge tank cap.

2. DESCRIPTION

The engine is a four cylinder in line overhead camshaft design transversely mounted in the front of the vehicle.

The camshaft runs in five integral support bearings in the camshaft housing which in turn is mounted directly onto the cylinder head and retained by the cylinder head bolts.

Camshaft end float is controlled by a thrust plate engaged in a groove machined in the rear camshaft journal. The camshaft is driven via a reinforced rubber belt by the crankshaft timing gear.

The aluminium cross flow cylinder head houses the tappets, rocker arms and valve assemblies. An oil pressure relief valve is fitted to the cylinder head to maintain oil pressure to the hydraulic tappets at a predetermined setting.

The exhaust valve springs are fitted with rotators mounted below the valve springs which rotate the exhaust valve assemblies. The rocker arms pivot on hydraulic tappet assemblies and fit into notched lash pads mounted on the valve stems. The camshaft lobes bear directly onto the rocker arms and due to the nature of the hydraulic tappet assemblies, no provision is made for tappet clearance adjustment.

The cylinder block is a cast iron alloy deep skirt design, and the crankshaft is supported in the cylinder block by five main bearings of the precision insert replaceable type. Crankshaft end float is controlled by the flanged centre main bearing. Connecting rods are 'I' section forgings fitted with precision insert replaceable big end bearings. The gudgeon pins are an interference fit in the connecting rod and a floating fit in the piston.

The cast aluminium pistons are fitted with two compression rings and one three piece oil control ring. The top of the piston is machined to give adequate valve to piston clearance in the advent of camshaft drive belt failure.

The oil pump is of the twin rotor type and is mounted directly to the front face of the cylinder block. The inner rotor is internally driven by the crankshaft. The oil pump pressure relief valve is of the non adjustable, plunger and spring type, mounted in the oil pump body.

The pump draws oil through a screen in the sump and delivers it via a full flow replaceable oil filter to the oil gallery from where it is distributed to the hydraulic tappets, camshaft and crankshaft bearings and to the overhead rocker and valve mechanism.

3. ENGINE ASSEMBLY

Special Equipment Required:

To Remove and Instal — Suitable lifting tackle

TO REMOVE

- (1) Raise the engine bonnet and fit covers to both front fenders.
- (2) Disconnect the positive and negative battery terminals, the fusible link connector and the connectors at the ignition coil, the coil module and the main wiring harness connector situated adjacent to the battery.
- (3) Disconnect the engine and body earth leads.

(4) Mark around the bonnet hinges with a lead pencil to facilitate correct installation, remove the retaining bolts and remove the bonnet from the vehicle.

(5) Disconnect the bottom radiator hose and drain the cooling system, refer to the Cooling System section if necessary. Disconnect the coolant hoses from the surge tank and the top radiator hose from the thermostat housing.

NOTE: If the coolant is to be reused drain the coolant into a clean container.

(6) Remove the air cleaner assembly from the engine, and disconnect the throttle cable from the carburettor and bracket. If necessary refer to the Fuel System section for the correct procedure.

(7) Disconnect the heater hoses from the bulkhead connections and the thermostat housing.

(8) Suitably tag or mark the emission control vacuum hoses and disconnect them from the vacuum control module (VCM) and the engine. Disconnect the brake vacuum hose from the inlet manifold.

(9) Disconnect the fuel supply hose from the fuel pump. Suitably plug the hose to prevent fuel leakage.

(10) Remove the radiator fan assembly as outlined in the Cooling System section.

(11) On manual transmission models, remove the clutch cable retaining clip and unscrew the adjusting nut from the cable. Release the cable from the slot in the clutch lever.

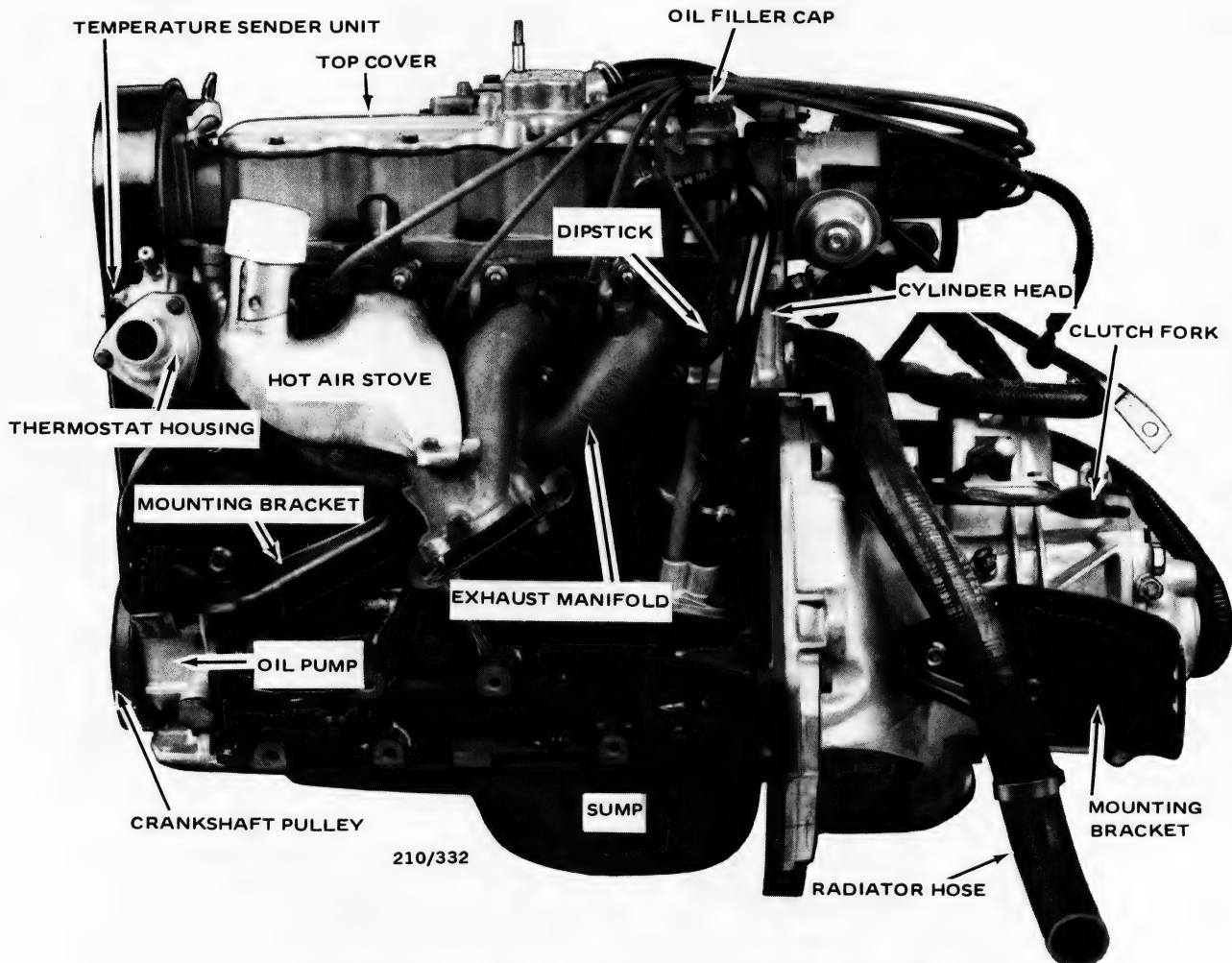
Disconnect the gearchange selector rod adjusting coupling from the selector arm. Refer if necessary to the Manual Transaxle section.

(12) On automatic transmission models disconnect the gear selector cable from the transaxle, refer if necessary to the Automatic Transaxle section.

(13) Remove the speedometer cable from the transaxle housing.

(14) On vehicles equipped with air conditioning remove the compressor from the engine. Leave the pressure hoses connected and tie the compressor clear of the engine.

(15) Raise the front of the vehicle sufficiently to allow enough clearance to enable the engine to be with-



Front view of engine and four speed manual transaxle assembly.

drawn forward below the front bumper assembly. Place the vehicle on chassis stands. Refer to the Wheels and Tyres section for the correct procedure.

Drain the oils from the engine and the transaxle into suitable containers.

(16) Remove the front wheels after marking the wheels in relation to the front hubs to ensure their correct positioning on assembly.

(17) On automatic transmission models disconnect the transmission cooler hoses from the radiator. Plug the unions to prevent ingress of dirt etc.

(18) Remove the stabiliser bar link bolts from the control arms and disconnect the ball joints from the suspension struts. If necessary refer to the Front Suspension section for the correct procedures.

(19) Support the control arm and carrier assemblies on a suitable jack and remove the control arm carriers to body bolts. Lower the jack and remove the assembly from the vehicle. Ensure that the brake and fuel lines are disconnected from the locating bracket on the right hand carrier assembly.

(20) Remove the two bolts and springs securing the

intermediate pipe to the engine pipe flexible joint.

(21) Remove the four nuts securing the engine pipe to the exhaust manifold flange.

(22) Undo the support bracket to engine pipe retaining bolt taking care to collect the insulators and spacers and remove the engine pipe from the vehicle.

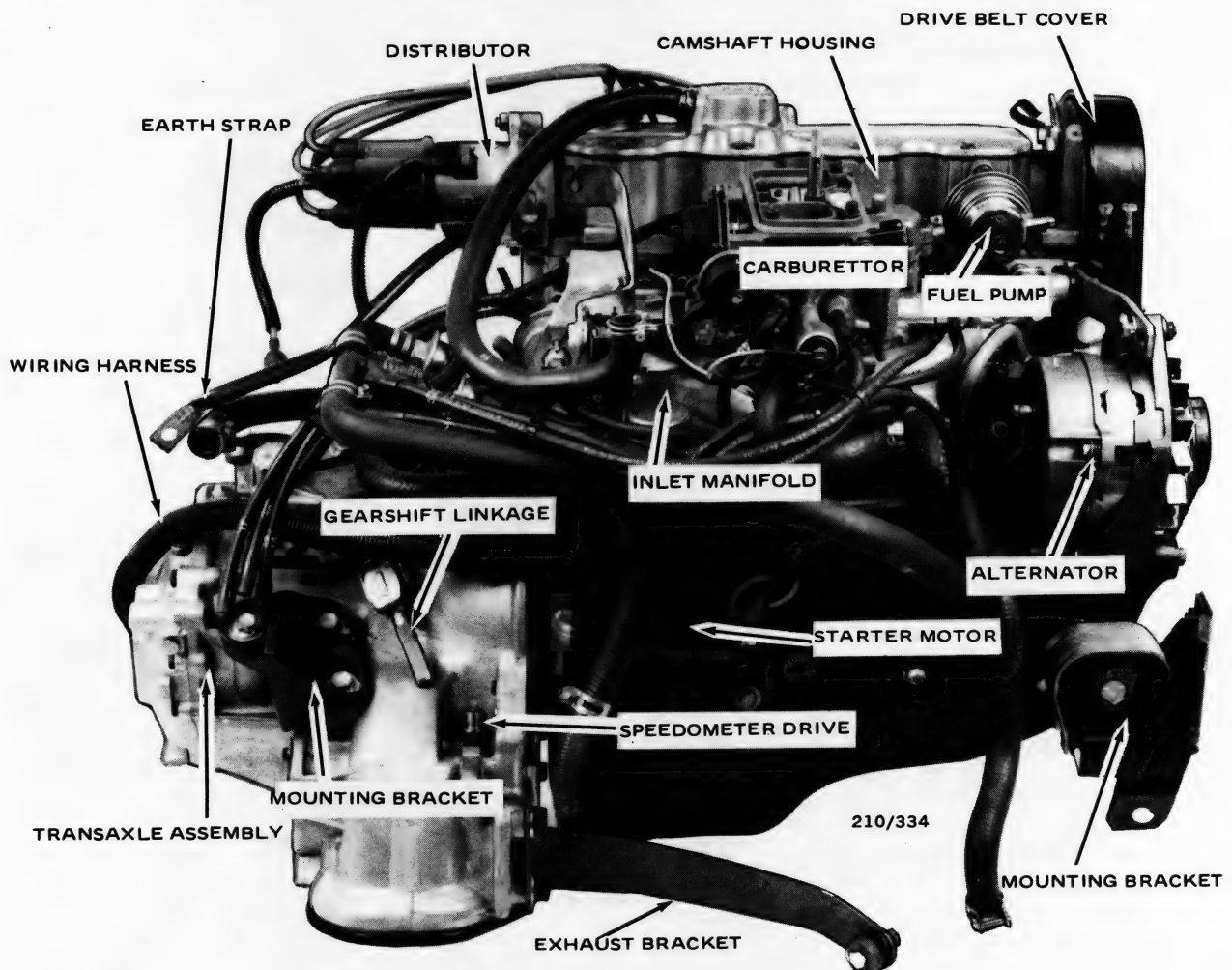
(23) Refer to the Manual Transaxle section and remove the drive shafts from the transaxle.

(24) Instal suitable lifting tackle to the enging and raise the engine slightly to take the weight off the engine mountings.

(25) Remove the two bolts securing the engine bracket to the torque damper at the left hand front of the engine.

(26) Working inside the right hand wheel arch remove the three bolts securing the right hand rear engine mounting bracket to the body. From inside the engine compartment remove the remaining bolt securing the bracket to the bulkhead. Remove the bolt and nut securing the engine mounting to the alternator bracket and remove the mounting and bracket assembly.

(27) Remove the stays from beneath the left hand



Rear view of engine and four speed manual transaxle assembly.

rear and right hand front engine mountings then remove the two nuts securing each of the mountings to the vehicle body.

(28) Slowly lower the engine and transaxle assembly from the engine compartment ensuring that all the hoses and wires are disconnected.

NOTE: To aid removal of the engine assembly, lower the assembly onto a suitable trolley which can then be easily manoeuvred from beneath the vehicle.

TO INSTAL

Installation is a reversal of the removal procedure with attention to the following points:

(1) Position the engine beneath the front of the vehicle.

(2) Instal suitable lifting tackle and raise the engine assembly into position in the engine compartment.

(3) Instal the engine mounting bolts finger tight and remove the lifting tackle.

(4) Instal a new exhaust flange gasket on the engine pipe and ensure the pipe is correctly positioned at the intermediate pipe flexible joint. If necessary refer to the Exhaust System heading.

(5) Refer to the Manual Transaxle section and refit the drive shaft assemblies.

(6) Place the carrier assemblies on a suitable jack and raise them into position under the vehicle body. Instal new micro encapsulated bolts and torque the bolts to Specifications. Refer to the Front Suspension section for the correct bolt tightening sequence and torque settings.

(7) Fit the stabiliser bar link bolts to the lower control arms and connect the ball joints to the suspension struts. Refer to the Front Suspension section for correct procedure.

(8) Securely tighten the engine mountings as outlined under the heading Engine Mountings and Torque Damper.

(9) Fit the front wheels ensuring the marks previously made on the wheel and hub are aligned. Tighten the wheel bolts as much as possible. Lower the vehicle to the ground and tighten the wheel bolts securely.

(10) Refill the engine and transaxle with the correct amount and grade of oil recommended for each unit.

(11) Refill the radiator with clean water and add corrosion inhibitor or anti-freeze solution as necessary.

(12) Check that all wiring is connected and correctly installed in the retaining clamps.

(13) Check the clutch pedal adjustment and operation on vehicles fitted with manual transmission and the transmission selector linkage on vehicles fitted with either automatic or manual transmission. Refer to the appropriate section for the correct procedures.

(14) Start the engine, and check thoroughly for oil, fuel, exhaust and water leaks and repair as necessary.

(15) Recheck the oil and the water levels and top up as necessary.

4. CAMSHAFT DRIVE BELT

Special Equipment Required:

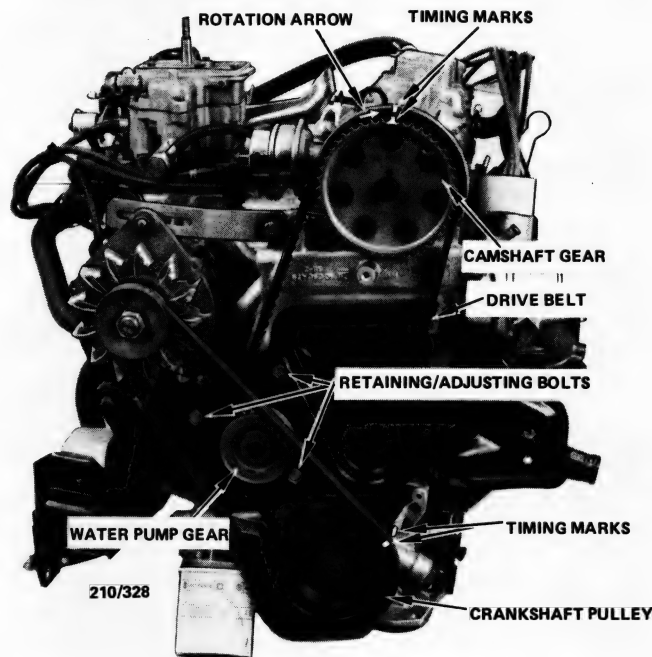
To Adjust - Drive belt adjusting tool

TO REMOVE

(1) Disconnect the earth lead from the negative battery terminal.

(2) Loosen the alternator adjusting and mounting bolts.

(3) Move the alternator towards the engine and remove the alternator drive belt.



Side view of engine with timing marks aligned. Drive belt cover removed.

(4) Remove the retaining bolts from the camshaft drive belt cover and remove the cover from the vehicle.

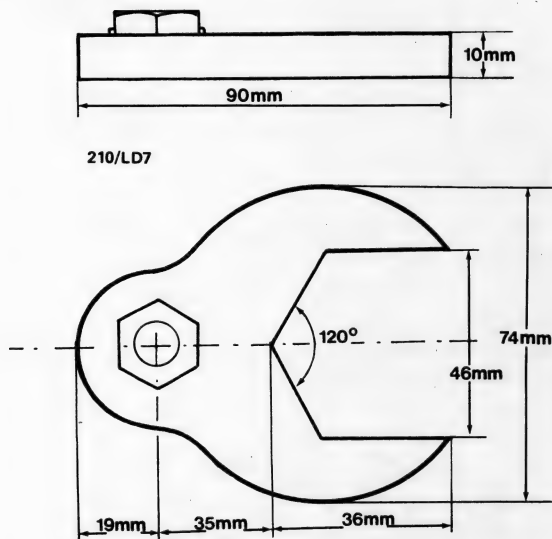
NOTE: The two lower retaining bolts can be more easily removed by working through the right hand wheel arch.

(5) Turn the engine in the direction of rotation until the timing mark on the camshaft gear and the notch on the camshaft housing are aligned and the timing mark on the crankshaft pulley and the pointer on the oil pump housing are also aligned.

(6) If the drive belt is to be reused, suitably mark the drive belt with an arrow to ensure it is refitted in the same direction of rotation.

(7) Remove the four bolts securing the crankshaft pulley to the timing gear and remove the pulley.

(8) Loosen the water pump retaining/adjusting bolts and using the adjusting tool turn the water pump to release the tension on the camshaft drive belt.



Line drawing showing dimensions for the fabrication of a camshaft drive belt adjusting tool.

NOTE: A drive belt tension adjusting tool can be manufactured from a piece of 10 mm thick steel to the dimensions given in the illustration.

(9) Slide the drive belt from the camshaft and crankshaft gears. Do not rotate the engine or the camshaft.

TO CHECK AND INSPECT

(1) Inspect the drive belt for any signs of wear, damaged teeth or torn backing. Renew the belt if it is contaminated by oil. Do not wash or clean a drive belt in solvents. Any slight contamination can be wiped off using a dry cloth.

NOTE: If the drive belt is contaminated with oil, the crankshaft and camshaft oil seals must be checked and any oil leak rectified prior to fitting a new drive belt.

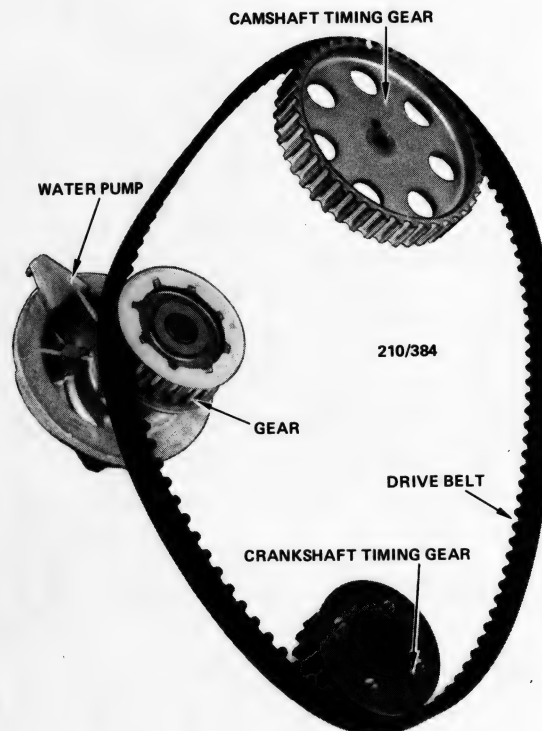
(2) Check the water pump for rough or excessively noisy operation. Ensure that the assembly slides smoothly in the cylinder block and that the seal is not leaking. Refer to the Cooling System section if it is necessary to replace the water pump assembly.

(3) Check the water pump, camshaft and crankshaft gears for any abnormal wear or damage.

TO INSTAL

(1) Check that the camshaft and crankshaft timing gears have not been moved and that the timing marks are still aligned. It will be necessary to temporarily instal the crankshaft pulley to check that the timing marks are still aligned.

(2) Instal the drive belt to the crankshaft timing gear around the water pump gear and onto the camshaft timing gear.



Camshaft drive belt and tensioner components.

NOTE: If the original drive belt was refitted ensure that the arrow marked on the belt prior to removal is pointing in the direction of rotation.

(3) Use the adjusting tool to turn the water pump assembly sufficiently to engage the water pump pulley with the drive belt.

(4) Ensure that the drive belt is correctly meshed with the teeth of the camshaft, crankshaft and water pump gears. Fit the crankshaft pulley and torque the bolts to Specifications.

(5) Adjust the drive belt as outlined under the following heading.

(6) Fit the alternator drive belt. Refer to the Engine Tune-up section for the correct adjusting procedure.

TO ADJUST

(1) Remove the drive belt cover as previously described. It is not necessary to remove the alternator drive belt if the camshaft drive belt is only to be adjusted.

(2) Turn the engine in the direction of rotation until the timing mark on the camshaft gear and the notch on the camshaft housing are aligned.

(3) Loosen the water pump retaining/adjusting bolts and using the adjusting tool turn the water pump to give the required belt tension. The belt is correctly tensioned when it can be grasped between thumb and forefinger midway between the camshaft drive gear and the water pump gear and turned ninety degrees from its operating position. After the belt has been tensioned tor-

que the water pump retaining/adjusting bolts to Specifications.

NOTE: Over tensioning of the drive belt will result in noisy operation and premature wear of the belt.

- (4) Instal the drive belt cover.

5. MANIFOLDS

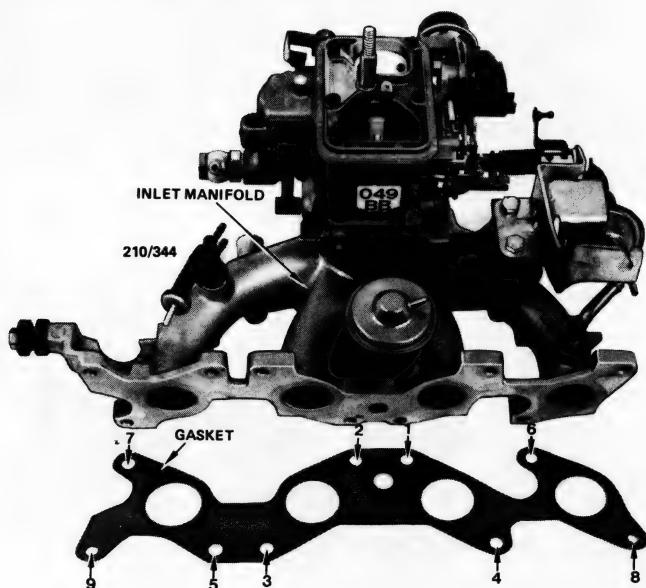
INLET MANIFOLD

To Remove and Instal

- (1) Disconnect the earth lead from the negative battery terminal.
- (2) Remove the air cleaner assembly. Refer to the Fuel System section for the correct procedure.
- (3) Unscrew the locknut securing the outer throttle cable to its mounting bracket. Disconnect the throttle cable from the carburettor linkage and place the cable to one side.
- (4) Disconnect the bottom radiator hose from the radiator and drain the cooling system. Disconnect the upper end of the hose from the transfer pipe at the rear of the engine.

NOTE: If the coolant is to be reused drain the coolant into a clean container.

- (5) Remove the alternator adjusting bracket mounting bolt and insulating washers from the inlet manifold. Loosen the adjusting bolt at the alternator and the mounting bolt at the alternator to block bracket.
- (6) Remove the alternator drive belt and move the alternator away from the engine.



Inlet manifold and gasket showing correct tightening sequence.

- (7) Remove the bolts securing the radiator coolant transfer pipe to the rear of the engine block.

- (8) Disconnect the coolant and vacuum hoses from the inlet manifold. Tag the vacuum hoses to ensure their correct relocation on assembly.

- (9) Disconnect the electrical connections from the carburettor.

- (10) Remove the bolt securing the pulsair injection pipe mounting bracket to the inlet manifold and remove the screws attaching the gulp valve to the injection pipe bracket.

- (11) Remove the upper and lower manifold retaining nuts and lift the inlet manifold from the vehicle.

Installation is a reversal of the removal procedure with attention to the following points.

- (1) Ensure that all the carbon and old gasket material is cleaned from the manifold and cylinder head face.

- (2) Check the face of the manifold for warping with a straight edge and feeler gauges.

- (3) Use a new gasket and ensure that all mounting nut threads are coated with a suitable anti-seize solution and tightened to the specified torque in the correct sequence as shown in the illustration.

- (4) Connect the throttle cable to the carburettor and adjust the cable as outlined in the Fuel System section.

- (5) Ensure that the emission and vacuum hoses are connected correctly.

- (6) Adjust the alternator drive belt tension. Refer to the Engine Tune-up section for the correct procedure.

- (7) Refill the cooling system, add corrosion inhibitor and run the engine to check for leaks.

EXHAUST MANIFOLD

To Remove and Instal

- (1) Disconnect the earth lead from the negative battery terminal.

- (2) Remove the air cleaner assembly. Refer to the Fuel System section for the correct procedure.

- (3) Remove the front exhaust pipe flange mounting nuts and separate the exhaust pipe from the manifold.

- (4) Remove the bolts securing the exhaust heat stove to the manifold. Separate the heat stove from the manifold.

- (5) Remove the exhaust manifold to cylinder head retaining nuts and slide the manifold forward clear of the manifold studs and remove it from the vehicle. Discard the manifold gasket.

Installation is a reversal of the removal procedure with attention to the following points:

- (1) Ensure that all carbon is cleaned from the manifold and cylinder head mating surfaces.

- (2) Check the face of the manifold for warpage with a straight edge and feeler gauges.

- (3) Use new gaskets on assembly.

- (4) Torque the exhaust manifold retaining nuts to Specifications in the sequence shown in the illustration.



Exhaust manifold and components showing correct tightening sequence.

(5) Coat the threads of the front exhaust pipe to manifold retaining nuts with a suitable anti-seize solution and torque the nuts to Specifications.

6. CYLINDER HEAD

Special Equipment Required:

To Dismantle and Assemble—Valve spring compressor

To Inspect—Dial gauge and straight edge

To Instal—Drive belt adjusting tool

TO REMOVE AND INSTAL

(1) Disconnect the earth lead from the negative battery terminal and the earth strap from the cylinder head.

(2) Remove the air cleaner assembly from the engine. If necessary refer to the Fuel System section for the correct procedure.

(3) Disconnect the bottom radiator hose and drain the cooling system, refer to the Cooling System section if necessary.

NOTE: If the coolant is to be reused drain the coolant into a clean container.

(4) Loosen the hose clamps and disconnect the coolant hoses from the heater valve, carburettor, inlet manifold and thermostat housing.

(5) Disconnect all the vacuum hoses from the inlet manifold and the carburettor, also the hose from the vacuum control module to the air injection pipe. Suitably mark the hoses to ensure their correct assembly.

(6) Disconnect the hoses from the fuel pump. Plug the hoses to prevent fuel leakage.

(7) Unscrew the locknut securing the outer throttle cable to its mounting bracket. Disconnect the throttle cable from the carburettor linkage and place the cable to one side.

(8) Disconnect the wiring at the carburettor and distributor connectors.

(9) Remove the nuts securing the front exhaust pipe to the exhaust manifold flange.

(10) Remove the alternator adjusting bracket mounting bolt and insulating washers from the inlet manifold. Loosen the adjusting bolt at the alternator and slide the bracket away from the cylinder head.

(11) Remove the camshaft drive belt cover retaining bolts and lift the cover from the engine.

NOTE: Access to the two lower retaining bolts can be gained by working through the right hand wheel arch.

(12) Turn the engine in the direction of rotation until the timing mark on the camshaft gear and the notch on the camshaft housing are aligned and the timing mark on the crankshaft pulley and the pointer on the oil pump housing are adjacent to each other.

(13) Loosen the water pump retaining/adjusting bolts and turn the water pump assembly, with the aid of the special tool as previously described, to release the tension on the camshaft drive belt. Slide the drive belt from the camshaft timing gear.

(14) Remove the distributor as outlined in the Electrical System section.

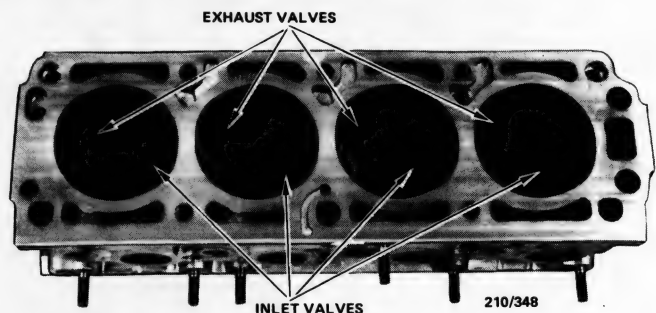
(15) Loosen the cylinder head bolts in the reverse order of the tightening sequence, backing off each bolt a quarter of a turn then half a turn at a time until the bolts are free.

NOTE: Do not loosen the head bolts while the engine is hot, as damage to the cylinder head could result.

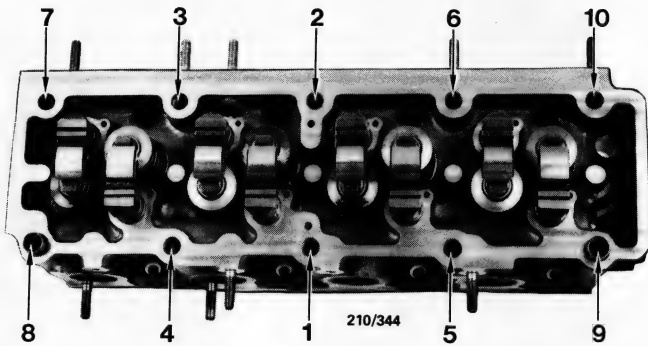
(16) Remove the cylinder head bolts and lift the camshaft housing from the cylinder head.

(17) The cylinder head can now be removed from the cylinder block.

Installation is a reversal of the removal procedure with attention to the following points:



Cylinder head face showing valve arrangement.



Assembled view of cylinder head showing cylinder head bolt tightening sequence.

(1) Thoroughly clean the gasket surfaces of the cylinder head, cylinder block and camshaft housing and check all mating surfaces with a straight edge. Ensure all the oilways are clean and free from any foreign material and lightly oil all operating parts with engine oil.

(2) Instal new gaskets throughout during assembly.

(3) Ensure the cylinder head and gasket are located correctly on the dowels on the cylinder block face. The head gasket is marked 'TOP' to aid in correct installation.

(4) With the cylinder head and gasket in position on the cylinder block apply an even smear of Loctite 573 to the cylinder head and camshaft housing mating surfaces. Take care that no sealant is forced into the oil passages.

(5) Clean the threads of the cylinder head bolts and instal the bolts finger tight.

(6) Apply an initial torque to the cylinder head bolts of 25 Nm in the correct sequence as shown in the illustration. Further tighten the head bolts in the correct sequence in three separate 60 degrees steps. See Specifications.

(7) Check that the timing marks on the crankshaft front pulley and the pointer on the oil pump housing are still aligned and the timing marks on the camshaft gear and the camshaft housing are adjacent to each other. Slide the camshaft drive belt into position on the timing gears.

(8) Adjust the belt tension by moving the water pump body in the required direction using the special tool as previously described. The belt is correctly tensioned when it can be grasped between thumb and forefinger midway between the camshaft gear and the water pump gear and turned ninety degrees from its running position. Tighten the water pump bolts to Specifications after the adjustment is complete.

(9) Instal the distributor as described in the Electrical System section.

(10) Using a new gasket, connect the front exhaust pipe to the exhaust manifold flange. Coat the nuts in a suitable anti-seize compound and instal and tighten the nuts to the specified torque.

(11) Connect all hoses and electrical wiring disconnected during the removal of the cylinder head. Ensure that all the hoses are returned to their original positions.

(12) Connect the throttle cable and adjust the cable as described in the Fuel System section.

(13) Fill the surge tank with coolant containing the correct amount of corrosion inhibitor.

(14) Check the engine oil for correct level on the dipstick and for dilution. Change the engine oil and filter if necessary.

(15) Start the engine and check for oil or water leaks and rectify as necessary. Check and if necessary adjust the ignition timing as described in the Engine Tune-up section.

(16) When the engine has reached normal operating temperature, retighten the cylinder head bolts another 30–50 degrees in the correct sequence shown in the illustration.

TO DISMANTLE

(1) Remove the cylinder head as previously described.

(2) Remove the thermostat housing and sealing ring from the cylinder head.

(3) Remove the pulsair injection pipe to inlet manifold attaching bolt, the nuts securing the inlet and exhaust manifolds to the cylinder head and remove the manifolds. Discard the gaskets.

(4) Remove the pulsair injection pipe mounting nuts and detach the pipes from the cylinder head.

(5) Lift the rocker arm and thrust pad from the top of each valve assembly, keeping them in order for assembly to their original positions.

(6) Slide each hydraulic tappet from its bore in the cylinder head, also keeping them in order for assembly to their original positions.

(7) Before removing the valves, the deposits in the



Dismantled view of valve operating components.

combustion chambers should be cleaned off. This will protect the valve seats, care should be taken not to damage the cylinder head gasket face.

(8) Using a suitable valve spring compressor, compress each spring in turn. Remove the split retaining collets and slowly release the compressor.

(9) Remove the valve spring retainers and valve springs.

(10) Remove the valve stem seals from the top of the valve guides and detach the exhaust valve rotators and the inlet valve spring seats, from the cylinder head.

(11) Remove any burrs from the valve stem grooves to prevent damage to the valve guides when the valves are removed from the cylinder head.

(12) Remove the valves, keeping them in order for assembly to their original positions.

NOTE: To keep the valve assemblies in order have a rack numbered from 1 to 8 and install the components in this rack, starting from the front of the cylinder head.

(13) If the oil pressure relief valve in the cylinder head is to be renewed, proceed as follows:

(a) Using a suitable drift, remove the welch plug from the distributor end of the cylinder head.

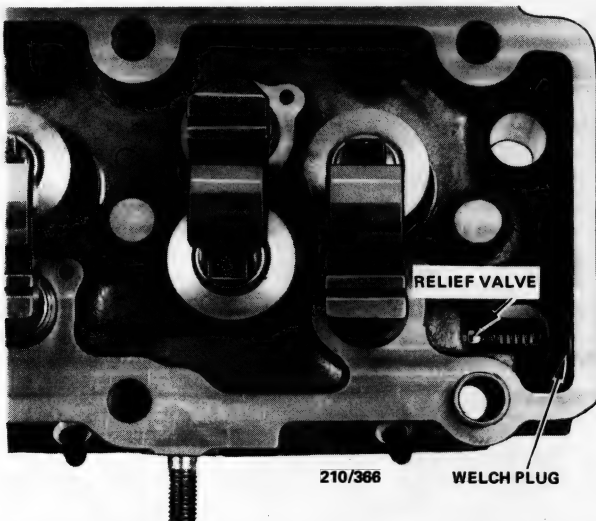
(b) Remove the recessed screw from the thermostat housing end of the cylinder head.

(c) Using a long brass drift inserted in the oilway through the tappet bores from the thermostat housing end, remove the oil pressure relief valve from the cylinder head. Discard the relief valve.

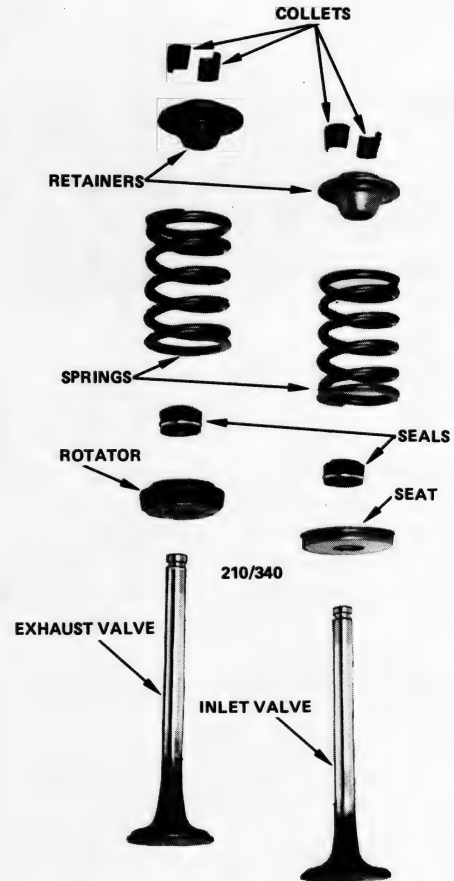
TO CLEAN AND INSPECT

(1) Clean the valves thoroughly and discard any burnt, warped or cracked valves.

(2) Have the valves refaced to the recommended angle on a valve refacing machine. The valve stem tips are specially hardened and should not be refaced.



Installed view of cylinder head oil pressure relief valve.

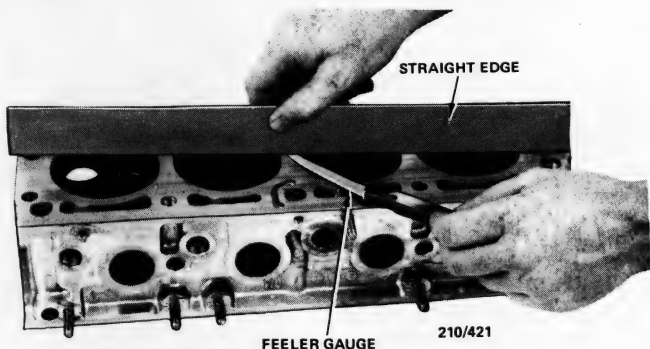


Dismantled view of valve and spring components.

(3) Carefully clean the deposits from the inlet and exhaust ports, the auxiliary passages, the valve guides and the manifolds, taking care not to damage any mating surfaces.

(4) Clean the cylinder head mounting faces, wash the cylinder head in a suitable solvent and blow dry with compressed air. Blow through all the oil holes with compressed air to ensure that they are not blocked.

(5) Check the cylinder head for warpage diagonally and lengthwise using a straight edge and feeler gauges. Check Specifications for warpage and machining limits.



Method of checking cylinder head for distortion.

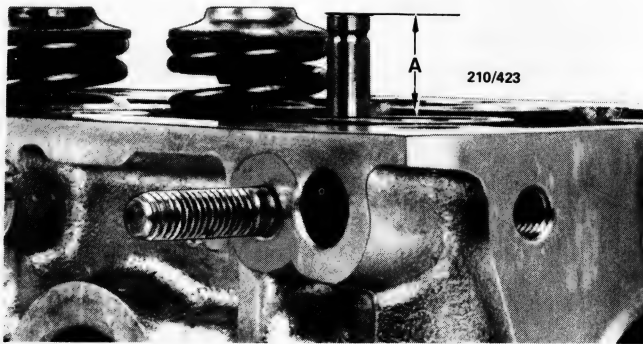
(6) Check the cylinder head face and combustion chambers for cracks, burn marks and corrosion.

(7) Check the valve stem to guide clearance. If the clearance is in excess of Specifications, then the valve guides must be reamed and the appropriate oversize valve fitted.

(8) Inspect the valve seats for pitting or burning and if necessary recut the seats with a valve seat cutter to the recommended angle. When the seats are correctly finished the seat widths should conform to Specifications.

(9) Lap the valves to the valve seats with a fine lapping compound. Apply a smear of Prussian blue to the valves on their respective seats to ensure that true and concentric seating has been gained.

(10) Fit each valve in its respective port and check the valve stem height above the cylinder head, see illustration. The extended height must not exceed 18.4 mm. If the height exceeds Specifications then the valve or the cylinder head must be replaced. Do not remove any material from the valve stem tip.



Dimension A is the correct position to measure the valve stem installed height.

(11) Check the valve spring tensions and compare with Specifications.

Check that the springs are not bent or distorted from heat.

If a spring tester is not available, check the springs by comparison with new springs. This can be done by using a surface plate and straight edge for checking the free length and by using a new spring and a used spring loaded in a vice end on end, with a plate in between. Measure from the plate to the vice jaw adjacent to both the new and used springs. A used spring is serviceable if it does not show collapse in excess of five percent when subjected to this comparison test.

(12) Check the exhaust valve rotators for wear, ensure that the rotators are free to rotate.

(13) Clean the cylinder block face of all carbon and rust deposits, also ensure that all old gaskets are removed. Do not allow the waste deposits to enter the oil or water galleries.

Clean all waste materials from the cylinder bores.

TO ASSEMBLE

Assembly is a reversal of the dismantling procedure with attention to the following points:

(1) Lubricate all component wear surfaces with

engine oil before assembly to ensure adequate lubrication when starting.

(2) If the oil pressure relief valve was removed from the cylinder head, proceed as follows:

(a) Using a suitable brass tube inserted in the welch plug hole at the distributor end of the cylinder head, tap the relief valve into position.

(b) Refit the welch plug and the recessed screw in their respective positions, after coating the plug and screw with a suitable sealer.

(3) Instal the inlet valve spring seats and the exhaust valve rotators over the valve guides before installing the valve stem seals onto the valve guides.

(4) Instal the valve stem seals, ensure that the rib of the moulding on the inside of the seal is correctly positioned in the groove of the valve guide and that the spring clip retainer is correctly positioned.

(5) Instal the valves to their original position in the cylinder head. Use care when installing the valves to prevent damage to the seals.

(6) Instal the valve springs, retainers end collets. Ensure that the valve retaining collets are fully seated in the valve stem groove before releasing the spring compressor.

(7) Fit the pulsair pipes to the cylinder head. Instal the inlet and exhaust manifolds using new gaskets and torque the mounting nuts to Specifications as previously described.

(8) Instal a new sealing ring to the thermostat housing, instal the housing to the cylinder head and torque the mounting bolts to Specifications.

(9) Ensure the tappet assemblies are filled with clean engine oil and fit the tappets in their respective bores in the cylinder head.

(10) Fit the thrust pads to the top of each valve assembly and instal the rocker arms, ensure that the components are returned to their original positions.

(11) Instal the cylinder head to the engine as previously described.

7. CAMSHAFT, ROCKER ARMS AND TAPPETS

Special Equipment Required:

To Check Camshaft End Float – Dial gauge, vee blocks and micrometers

To Instal – Drive belt adjusting tool

Removal of the camshaft, rocker arms or tappets with the camshaft housing in situation requires the use of a special valve spring compressing tool. This tool is used to compress the valve springs sufficiently so that the rocker arms can be removed from their position below the camshaft to allow the camshaft to be withdrawn from its housing.

The following operation should be followed to remove the camshaft without the aid of the special tool. It is recommended that a new cylinder head gasket is installed, as the cylinder head bolts must be withdrawn to remove the camshaft housing.

TO REMOVE

(1) Disconnect the earth lead from the negative battery terminal and the earth strap from the cylinder head.

(2) Remove the air cleaner assembly and disconnect the hoses from the fuel pump. If necessary refer to the Fuel System section.

(3) Remove the camshaft housing top cover retaining bolts, lift off the top cover and discard the gasket.

(4) Remove the distributor, distributor cap and high tension leads. If necessary refer to the Electrical System section for the correct procedure.

(5) Refer to the heading Camshaft Drive Belt for the correct procedure and remove the drive belt cover and disconnect the drive belt from the camshaft timing gear.

(6) Check the camshaft end float before removing the camshaft from the engine. Mount a magnetic dial gauge to the cylinder block with the pointer bearing on the distributor drive end of the camshaft.

(7) Lever the camshaft towards the dial gauge and zero the gauge. Now move the camshaft in the opposite direction away from the dial gauge and note the reading obtained. Check this measurement against Specifications.

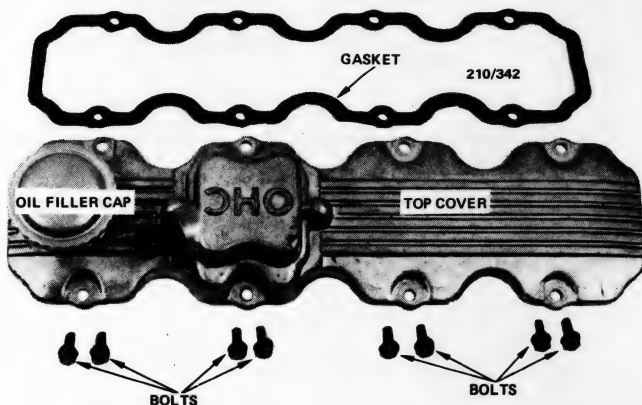
(8) If the measurement is not within Specifications, check the retaining plate and the retaining plate groove in the camshaft for wear or scoring after dismantling. Replace the defective parts as necessary on assembly.

(9) Disconnect the bottom radiator hose and drain the cooling system.

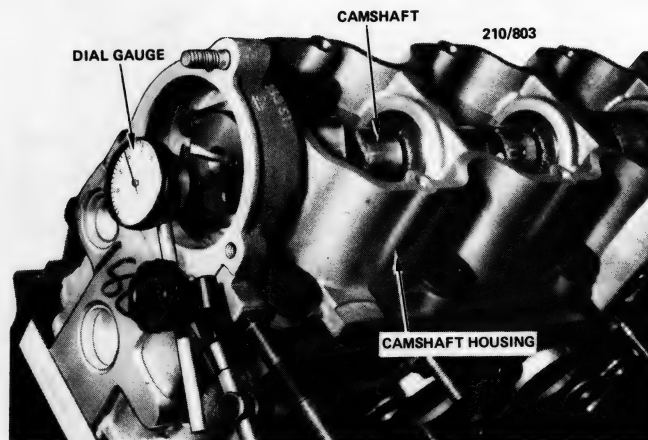
NOTE: If the coolant is to be reused drain the coolant into a clean container.

(10) Remove the cylinder head bolts in the reverse of the installation procedure backing off each bolt a quarter of a turn then half a turn at a time until the bolts are free.

NOTE: Do not loosen the cylinder head bolts while the engine is hot as damage to the cylinder head could result.



View of camshaft housing cover and gasket.



Method of checking camshaft end float.

(11) Remove the cylinder head bolts and lift the camshaft housing from the cylinder head.

(12) The rocker arms, thrust pads and tappet assemblies can now be removed from the cylinder head. Number a rack from 1 to 8 and keep each assembly in order so that they can be assembled to their original positions. (See page 45 for dismantled view of components.)

(13) Remove the fuel pump attaching nuts and lift off the fuel pump and gasket.

(14) Using a suitable size open end spanner hold the camshaft between the inlet and exhaust lobes of number four cylinder. Secure the camshaft and remove the timing gear retaining bolt. Withdraw the timing gear.

(15) From the distributor drive end of the camshaft housing, remove the two bolts securing the camshaft retaining plate to the camshaft housing and remove the retaining plate.

(16) Carefully withdraw the camshaft from the camshaft housing taking care to support the camshaft to avoid scoring the inner surfaces of the camshaft bearings.

(17) With a pointed drift tap a small hole in the front face of the oil seal. Insert a self tapping screw in the hole and using a pair of pliers pull on the screw to remove the oil seal from the housing. Discard the oil seal.

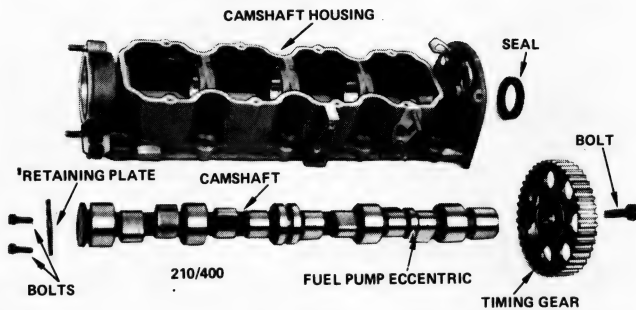
TO CLEAN AND INSPECT

(1) Wash all parts with a suitable cleaning solvent and blow dry with compressed air. Ensure that all oil ways in the camshaft and rocker arms are free from obstruction.

(2) Check the camshaft lobes, the rocker arms, the thrust pads and the tappet assemblies for pitting and wear. The tappet assemblies are non-serviceable and should be renewed as an assembly if wear is apparent or internal damage is suspected.

(3) Support the camshaft at each end on vee blocks and using a dial gauge with its plunger bearing on the centre journal rotate the camshaft and check for bend.

(4) Using suitable micrometers measure the outside of each camshaft journal and the inside of each camshaft tunnel in the camshaft housing. Compare these mea-



Dismantled view of camshaft housing and components.

surements to Specifications and replace defective parts as necessary.

(5) Check the retaining plate and the retaining plate groove in the camshaft for wear or scoring. Replace the defective parts as necessary.

(6) Renew any worn or damaged parts as necessary.

TO INSTALL

Installation is a reversal of the removal procedure with attention to the following points:

(1) Lubricate the lip of a new oil seal and position the seal squarely in the camshaft housing. Ensure that the lip of the seal faces towards the inside of the camshaft housing. Tap around the edge of the seal with a soft faced hammer until the seal is fully seated in the recess in the camshaft housing.

(2) Apply clean engine oil to the camshaft bearings and camshaft journals. Insert the camshaft into position taking care not to damage the bearings with the edges of the cam lobes or journals.

(3) Apply engine oil to the camshaft retaining plate and position it in the groove in the camshaft. Install the two retaining bolts and tension the bolts to Specifications.

(4) Fit the camshaft timing gear to the camshaft, ensuring it is correctly located. Tighten the timing gear retaining bolt to Specifications.

(5) Ensure that the tappet assemblies are full of clean engine oil and insert the tappets in their respective bores in the cylinder head. Fit the thrust pads to the top of the valve stems and install the rocker arms, also to their original positions.

(6) Clean the mating surfaces of the camshaft housing and cylinder head. Apply a smear of Loctite 573 to the cylinder head and camshaft housing mating surfaces. Take care that no sealant is forced into the oil passages and fit the camshaft housing to the cylinder head.

(7) Clean the threads of the cylinder head bolts and install the bolts finger tight.

(8) Apply an initial torque to the cylinder head bolts of 25 Nm in the correct sequence as shown in the illustration under the Cylinder Head heading. Further tighten the head bolts in the correct sequence, in three separate 60 degree steps. See Specifications.

(9) Check that the timing marks on the crankshaft front pulley and the pointer on the oil pump housing are still aligned and the timing marks on the camshaft gear and the camshaft housing are adjacent to each other. Slide the camshaft drive belt into position on the timing gears.

(10) Adjust the drive belt tension using the special tool as previously described by moving the water pump body in the required direction. The belt is correctly tensioned when it can be grasped between thumb and forefinger midway between the camshaft gear and the water pump gear and turned ninety degrees from its running position. Tighten the water pump bolts to Specifications after the adjustment is complete.

(11) Install the camshaft housing cover, using a new gasket. Tighten the retaining bolts to the specified torque.

(12) When the engine has reached normal operating temperature, retighten the cylinder head bolts another 30–50 degrees in the correct sequence.

TO RENEW CAMSHAFT OIL SEAL, CAMSHAFT INSTALLED

(1) Remove the camshaft drive belt from the camshaft timing gear as outlined under the heading Camshaft Drive Belt.

(2) Remove the camshaft housing cover retaining bolts, lift off the cover and discard the gasket.

(3) Use a suitable size open end spanner to hold the camshaft between the inlet and exhaust lobes of number four cylinder. Secure the camshaft and remove the timing gear retaining bolt. Remove the timing gear.

(4) With a pointed drift, tap a small hole in the front face of the oil seal. Insert a self tapping screw in the hole and using a pair of pliers pull on the screw to remove the oil seal from the housing.

(5) Clean the seal recess and the camshaft seal running surface.

(6) Lubricate the lip of a new oil seal and slide the seal over the camshaft. Ensure that the lip of the seal faces towards the inside of the camshaft housing. Position the seal squarely in the camshaft housing. Tap evenly around the edge of the seal until it is fully seated in the camshaft housing.

(7) Fit the camshaft timing gear to the camshaft, ensuring it is correctly located. Tighten the timing gear retaining bolt to Specifications. Do not allow the camshaft to rotate while tightening the bolt.

(8) Install and tension the drive belt as outlined under the heading Camshaft Drive Belt. Ensure that the timing marks are aligned.

(9) Install the camshaft housing cover, using a new gasket. Tighten the retaining bolts to the specified torque.

8. ENGINE SUMP

TO REMOVE

(1) Disconnect the earth lead from the negative battery terminal.

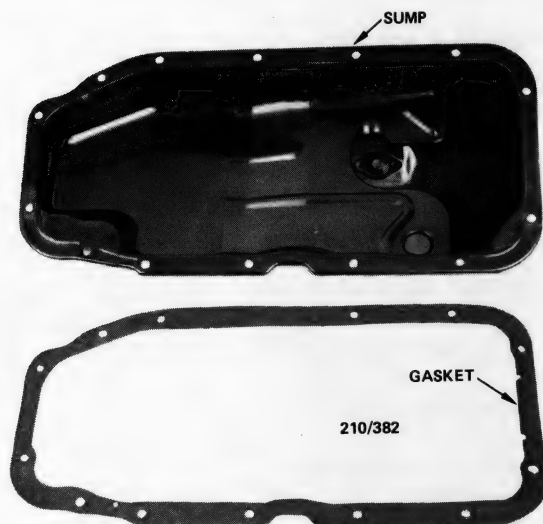
(2) Raise the front of the vehicle and support it on chassis stands. Refer to the Wheels and Tyres section for the correct procedure.

(3) Remove the sump plug and drain the engine oil into a suitable container. Instal and tighten the plug after the oil has been drained.

(4) Remove the retaining bolts and lift out the front suspension cross brace from between the left and right hand suspension assemblies.

(5) Remove the front exhaust pipe from the vehicle, as outlined under the Exhaust System heading.

(6) Remove the sump retaining bolts and washers and if necessary firmly bump the sump with the palm of the hand to loosen it from the engine. While lowering the sump, move it towards the crankshaft pulley side of the engine to allow the oil pick up screen to be disengaged from the internal sump baffle plate.



Engine sump and gasket.

TO INSTAL

(1) Remove any old gasket pieces from the sump and engine mating surfaces.

(2) Clean the sump in a suitable solvent and remove any carbon or sludge deposits. Ensure that the sump retaining bolt holes are free from obstructions.

(3) Check the sump for damage or cracks and ensure that the baffle plate is still correctly mounted in the sump.

(4) Apply a bead of Silastic to the oil pump to block mating joint. Coat the new sump gasket with a suitable gasket cement and position the gasket on the engine mating surface.

(5) Instal the engine sump to the engine and fit the sump retaining bolts after coating their threads with Loctite 242.

(6) Tighten the bolts evenly and torque to Specifications.

(7) Instal the front exhaust pipe using a new

gasket and coat the threads of the flange nuts with a suitable anti-seize solution before tightening the nuts to Specifications.

(8) Refit the front suspension cross brace and securely tighten the bolts.

(9) Ensure the sump drain plug is secure and lower the vehicle to the ground.

(10) Fill the engine with the specified amount and grade of engine oil.

(11) Start and run the engine and check for oil leaks.

9. OIL PUMP

TO REMOVE AND DISMANTLE

(1) Remove the camshaft drive belt as previously described.

(2) Remove the bolt and spacer securing the crankshaft timing gear to the crankshaft and withdraw the gear from the front of the shaft.

(3) Remove the timing gear locating key from its slot in the crankshaft and withdraw the spacer from its position at the rear of the keyway.

NOTE: If necessary the front crankshaft oil seal can now be replaced without further dismantling of the oil pump assembly.

(4) Remove the bolts securing the camshaft drive belt rear cover to the cylinder block and remove the cover from the engine.

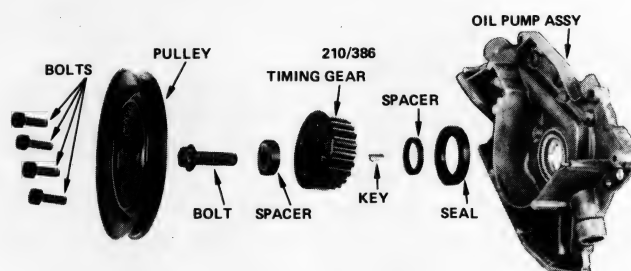
(5) Remove the dress trim if applicable and loosen the right hand front road wheel bolts.

(6) Raise the front of the vehicle and support it on chassis stands. Refer to the Wheels and Tyres section for the correct procedure.

(7) Mark the right hand front wheel in relation to the hub assembly to ensure it is refitted in its original position and remove the road wheel from the vehicle.

(8) Remove the screws and clips from the engine splash guard mounted to the inner, right hand front fender.

(9) Remove the engine sump as previously described.



View of oil pump and associated components.

(10) Disconnect the wiring from the oil pressure switch and remove the oil filter from the engine.

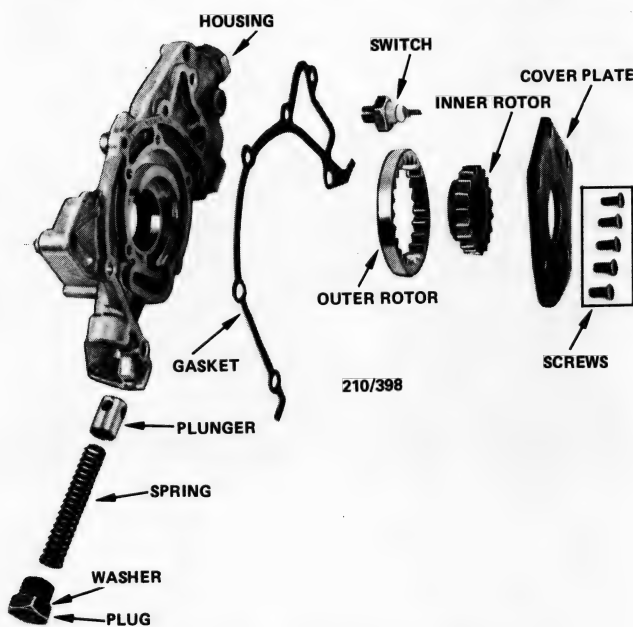
(11) Remove the two bolts retaining the oil pick up tube to the oil pump and disconnect the tube from the support bracket on the engine.

(12) Using a suitable socket remove the bolts retaining the oil pump housing to the cylinder block.

(13) Withdraw the oil pump over the crankshaft and remove the pump from the vehicle. Discard the gasket.

(14) Remove the screws retaining the oil pump cover plate and lift the cover plate from the rear of the oil pump.

(15) Lift the inner and outer rotors from the oil pump housing. Note that the outer rotor may be stamped with an 'F' which must face the cover plate on assembly.



Dismantled view of oil pump assembly.

(16) Unscrew the oil pressure relief valve plug and remove the relief spring and plunger from the oil pump housing. Discard the sealing washer from the relief valve plug.

(17) Remove the oil pressure switch from the pump housing and discard the sealing washer.

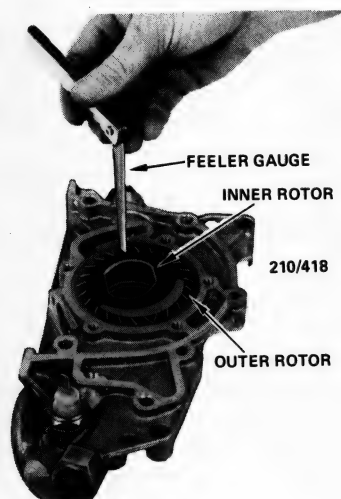
(18) Remove the crankshaft oil seal from the oil pump housing with a suitable drift.

TO CHECK AND INSPECT

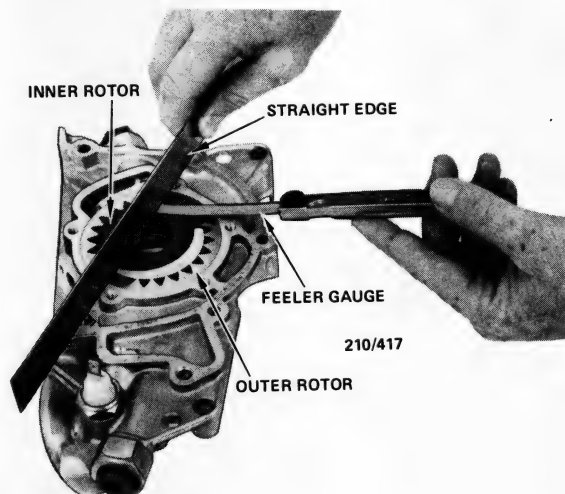
(1) Wash all pump components thoroughly in cleaning solvent and allow to dry.

(2) Inspect the inner and outer rotors and the cover plate for scoring or wear. Renew the rotors if these faults are evident.

(3) Temporarily instal the rotors into the oil pump housing. Check the backlash between the teeth of inner and outer rotors at the point where the rotor teeth are



Method of checking the oil pump inner to outer rotor backlash.



Method of checking the oil pump rotor end float.

most closely meshed. If the clearance at this point exceeds Specifications, check the rotors and housing for wear and renew as necessary.

(4) Check the rotor end float by placing a straight edge across the oil pump housing and measure the clearance between the straight edge and the rotors with a feeler gauge. Replace the oil pump if this clearance exceeds Specifications.

(5) Check the cover plate for wear and scoring and replace as necessary.

(6) Check the relief valve plunger and spring for wear or damage. Renew any faulty components as necessary.

TO ASSEMBLE AND INSTAL

Assembly and installation is a reversal of the removal and dismantling procedure with attention to the following points:

(1) Liberally lubricate all components with clean engine oil before assembly.

(2) Instal the relief valve plunger and spring into the pump housing and fit the relief valve plug using a new sealing washer. Tighten the plug securely.

(3) Instal the outer rotor into the pump housing with the 'F' mark on the rotor facing towards the cover plate. Instal the inner rotor ensuring it is correctly meshed with the teeth of the outer rotor.

(4) Fit the cover plate to the oil pump housing and torque the retaining screws to Specifications.

(5) Fit a new oil seal to the front of the oil pump housing. Ensure that the lip of the oil seal faces the inside of the oil pump housing.

(6) Fit a new sealing washer to the oil pressure switch and instal the switch to the oil pump housing.

(7) Turn the inner rotor of the oil pump by hand until the internal flats in the inner rotor are aligned with the corresponding flats on the crankshaft.

(8) Ensure the mating surfaces of the oil pump and cylinder block are thoroughly clean. Coat the oil pump gasket with a suitable oil resistant sealer and fit the oil pump and gasket to the cylinder block. It may be necessary to turn the oil pump slightly to align the inner rotor and crankshaft. Torque the retaining bolts to Specifications.

NOTE: Ensure the oil seal fitted to the oil pump is not damaged as the oil pump is positioned on the crankshaft.

(9) Fit the crankshaft timing gear spacer, the locating key and the timing gear to the crankshaft.

(10) Instal the timing gear spacer and retaining bolt and torque the bolt to Specifications.

(11) Ensure that the oil pump pick up tube and screen is clean and free from foreign material. Fit a new 'O' ring to the tube and position the pick up tube and screen in position on the oil pump and clip the tube into its mounting bracket. Coat the threads of the mounting bolts with Loctite 242 and torque the bolts to Specifications.

(12) Fill a new oil filter as much as possible with the correct grade of engine oil and instal the oil filter.

(13) Instal the sump as previously described.

(14) Replace the engine splash guard to the inner right hand fender.

(15) Instal the right hand road wheel and tighten the wheel bolts as much as possible. Ensure that the marks made on removal on the wheel, are correctly aligned.

Lower the vehicle to the ground and securely tighten the wheel bolts and replace the wheel trim if applicable.

(16) Fit and adjust the camshaft and alternator drive belts as described under the Camshaft Drive Belt heading.

(17) Fill the engine with the correct grade and quantity of oil.

(18) Start and run the engine and check for oil leaks.

10. PISTONS, CONNECTING RODS AND CYLINDER BORES

Special Equipment Required:

To Inspect - Micrometer, cylinder measuring gauge

To Remove Ridge from Bores - Ridge removal tool

To Deglaze Cylinder Bores - Cylinder surfacing hone

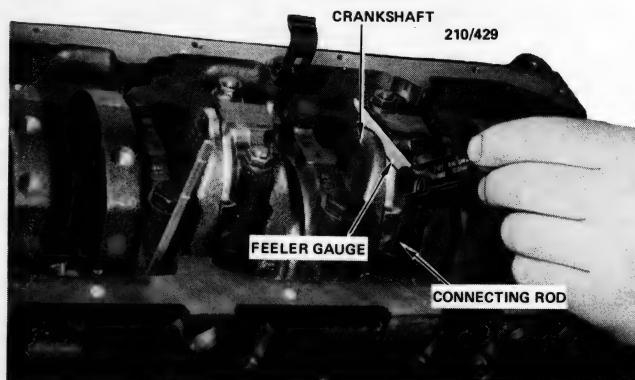
To Instal - Piston ring compressor

TO REMOVE

(1) Remove the engine sump and pick up tube as previously described.

(2) Remove the cylinder head as previously described.

(3) Mark the relationship of the pistons to their respective cylinders and the bearing caps to their respective connecting rods by letter stamps or centre punch marks.



Method of checking connecting rod side clearance.

(4) Measure each connecting rod for side clearance on the crankpin. (See illustration.) If the clearance exceeds Specifications a new connecting rod will have to be installed on assembly.

(5) With number one cylinder on the bottom of its stroke, remove the bearing cap nuts and the bearing cap.

Wipe the bearing shell and the exposed part of the journal with a piece of clean lint free cloth, insert a piece of Plastigage across the journal, instal the bearing cap and torque the nuts to Specifications.

Remove the nuts and cap and measure (with the scale on the packet) the spread width of the Plastigage to determine bearing clearance.

Compare the measurement to Specifications and if the bearing clearance exceeds the limit use a new bearing on assembly.

Repeat the procedure on the remaining cylinders and note each individual bearing clearance for reassembly purposes.

(6) Remove each bearing cap in turn, keeping them in order, and using a wooden hammer handle, push each piston assembly from the cylinder block and instal its respective bearing cap.

NOTE: Before removing the pistons remove the ridge from the top of the cylinder bore using a suitable ridge removal tool.

(7) Using a suitable ring removal tool remove and discard the piston rings.

TO INSPECT PISTONS AND CONNECTING RODS

(1) Inspect the pistons for scuff marks, scoring or burning.

(2) Clean all traces of carbon from the piston crowns and the ring grooves.

(3) Inspect the ring grooves of the pistons for excessive wear.

(4) Inspect each pair of bearing cap shells for wear on an outer edge only. If one or more pairs of the bearing shells are worn on the outside edges it is possible that the connecting rod is bent.

(5) Before proceeding to have a piston and/or connecting rod renewed inspect the cylinder block to see if it requires reboring or honing.

If the cylinder block requires reboring it is obvious that new pistons will have to be used.

(6) If a piston or connecting rod is to be renewed, a special tool will be required to press the gudgeon pin from the connecting rod. To instal the piston and gudgeon



Dismantled view of piston and connecting rod components.

pin to the connecting rod, the gudgeon pin boss must be accurately heated to 280 degrees C before the gudgeon pin can be inserted in the little end of the connecting rod.

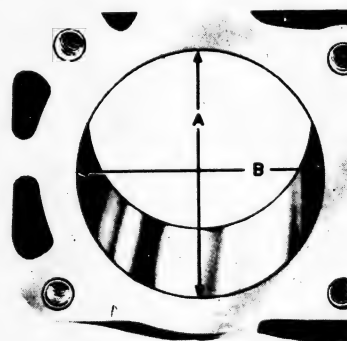
Replacement connecting rods are supplied only at their highest production weight and must be matched to the weight of the remaining connecting rods. See Specifications. For these reasons it is recommended that the work be entrusted to a reputable engine reconditioner who will have the specialised equipment and knowledge to carry out this work.

TO INSPECT CYLINDER BLOCK AND BORES

(1) With the pistons removed as previously described carry out the following checks and measuring procedures.

(2) Check the cylinder bores for cracks, scores or scuffs.

(3) Using an accurate cylinder gauge, measure each cylinder bore for wear. Take the measurements, at the upper and lower sections of the bore in two directions – along and across the block. Refer to the illustration.



Check for cylinder bore wear. Difference between 'A' and 'B' measurement at top of piston travel is out of round dimension. Difference between 'A' at top of piston and 'A' at bottom of piston travel is cylinder taper.

(4) If the wear in any cylinder exceeds the specified limit, rebore and hone all the cylinders to the nearest oversize for pistons and rings.

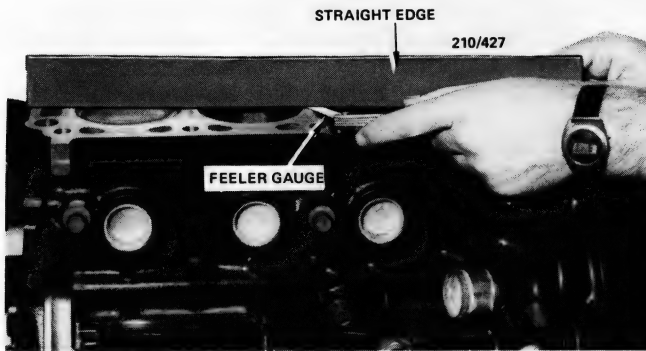
NOTE: A range of average pistons are available for standard cylinder bores.

(5) With a straight edge and feeler gauge, check the top face of the block for distortion, using the same procedure described for the cylinder head.

(6) If the engine is completely dismantled, thoroughly clean the cylinder block with a suitable solvent and compressed air paying particular attention to the oilways. Inspect the block for cracks and damage.

TO CHECK PISTON CLEARANCE

(1) Using an accurate cylinder measuring gauge measure and note the diameter of each bore as previously described.



Method of checking cylinder block face for distortion.

(2) Measure each piston skirt at a point 10.5mm above the bottom skirt edge and at right angles to the gudgeon pin axis.

(3) Note the difference between the bore and the piston skirt measurements. It is desirable to have a piston clearance of 0.02-0.04 mm. If the clearance exceeds the limit, refer to Specifications, then renew the piston, or bore and hone the cylinder, whichever is found necessary.

(4) Cylinders that have been rebored and honed to take the appropriate oversize pistons should have the piston clearances checked in the manner described.

TO DEGLAZE CYLINDER BORES

Cylinder bores that are fit for further service with original pistons but require re-ringing, should be deglazed with a hone.

(1) Use a surfacing hone with 280 grit stones for deglazing.

(2) Move the hone up and down the cylinder walls sufficiently fast enough to achieve a cross hatch pattern.

The cross hatch angle is most satisfactory for correct seating of piston rings when the hone marks intersect at 60 degrees.

NOTE: When deglazing, the cylinder should be honed only sufficiently to eliminate the glazed condition. Excessive honing will increase bore size and piston clearance.

(3) Use only honing oil for lubrication. Do not use engine or transmission oil, mineral spirits or kerosene.

(4) When honing is completed, ensure that the cylinder bore is thoroughly cleaned.

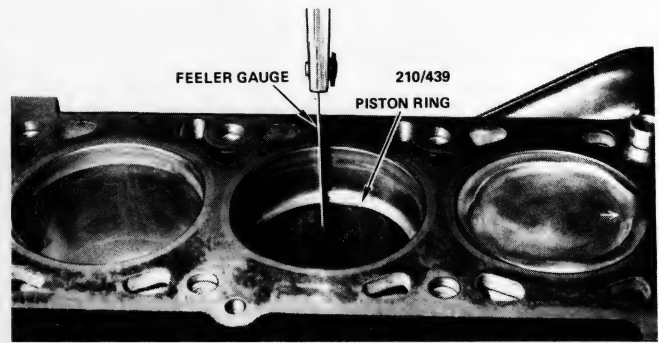
(5) After the cylinder block has been cleaned and dried, wipe the bores with lint free cloth, then smear them with engine oil to prevent rusting.

TO FIT NEW PISTON RINGS AND INSTAL

(1) Once the correct piston and bore relationship has been determined and the pistons renewed as necessary proceed as follows.

(2) Select a set of rings to suit the cylinder bore. (Standard or oversize as necessary.)

(3) Place a ring into number one cylinder bore and



Method of checking piston ring end gap. Piston ring shown at top of bore for illustrative purpose only.

using an inverted piston push the ring down to within 50 mm of the bottom of the cylinder bore.

(4) Withdraw the piston and measure the ring end gap. If the end gap does not conform to Specifications, adjust the gap by filing one end of the rings as necessary.

(5) Repeat the procedure on the remaining rings for that cylinder, place the rings with number one piston and then repeat the procedure for the remaining rings on the other cylinders.

(6) Assemble each oil control ring to its respective piston bottom groove as follows:

(a) Instal the oil ring expander to the piston groove, ensuring that the ends of the expander are butted together and not overlapped.

(b) Position one end of the lower side rail in the groove and 'peel' the ring over the piston and into the groove.

(c) Similarly fit the upper side rail.

(7) Instal the lower compression ring into the lower piston groove.

NOTE: The compression rings should be fitted with the manufacturers mark facing the top of the piston. To minimise the possibility of ring breakage the rings can be immersed in hot water prior to installation.

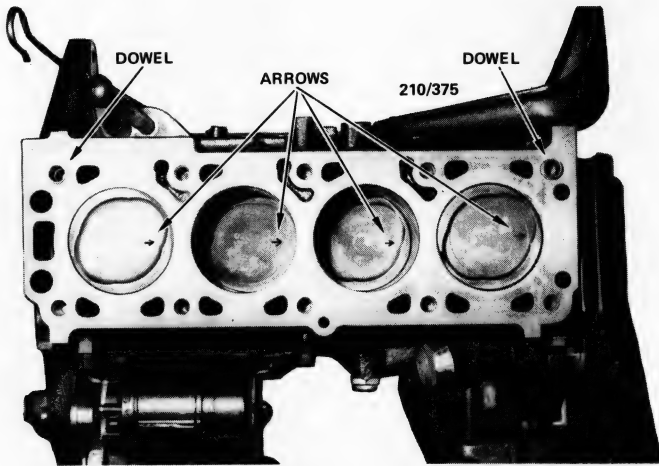
(8) Instal the upper compression ring into the upper piston groove.

(9) Space the compression ring gaps 120 deg apart, and ensure that the oil ring gaps and the join in the oil ring expander are not aligned.

(10) With the rings correctly installed and gapped, remove the bearing cap from the connecting rod. Use a piece of plastic tube or masking tape to cover the bearing cap bolts.

(11) Lightly lubricate the bearing shells and piston rings with engine oil and instal the piston into the cylinder using a ring compressing tool.

NOTE: The pistons must be installed into the cylinder block with the arrow pointing towards the front of the engine and to the cylinders from which they were removed.



Pistons correctly installed to cylinder block with arrows facing to front of engine.

(12) Remove the plastic tube or masking tape and install the bearing caps according to the marks made on removal. Torque the cap nuts to Specification.

NOTE: If on dismantling it was found that new bearing shells were needed place them into the connecting rod and cap before installing the cap to the connecting rod.

(13) If new bearing shells were installed recheck the bearing clearance as previously described.

(14) With the bearing clearance as specified instal the remaining pistons in the same manner.

(15) With all connecting rod nuts tightened to Specifications instal the associated components by referring to the various relevant headings.

11. CRANKSHAFT AND MAIN BEARINGS

Special Equipment Required:

To Inspect - Micrometer, vee blocks, dial gauge

TO REMOVE

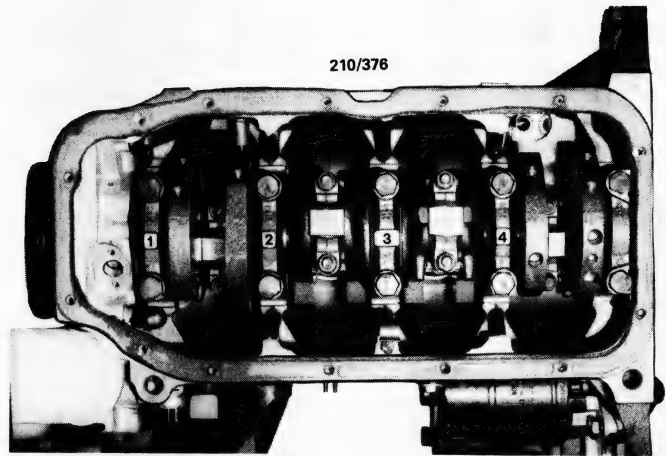
(1) With the engine assembly removed from the vehicle and the transmission separated from the engine, refer to the appropriate headings or sections and remove the following: Sump, oil pick up tube, oil pump, and fly-wheel or drive plate.

(2) Remove the crankshaft rear oil seal from the rear main bearing cap and engine block. Discard the oil seal.

(3) Ensure that all main bearing and connecting rod bearing caps are numbered to ensure correct assembly.

(4) Remove the connecting rod nuts and caps keeping them in order and push each piston and connecting rod slightly up into the bore without pushing the piston beyond its upper limit.

(5) Check crankshaft end float clearance by inserting a feeler gauge between the shaft and the centre



View of engine showing numbering and correct location of main bearing caps.

main bearing, or by mounting a dial gauge with its plunger against one end of the shaft.

(6) Push the crankshaft into contact with the front edge of the centre main bearing, then lever the shaft forward to determine the clearance.

(7) If the clearance exceeds Specifications then renew the centre main bearing on reassembly.

(8) Check the main bearing clearance by the Plastigage method as follows:

(a) Remove one bearing cap and with a piece of rag wipe the journal and bearing clean.

(b) Position a piece of Plastigage, the approximate length of the bearing width, and slightly off centre, on to the bearing surface of the crankshaft journal.

(c) Instal the bearing cap and tighten the cap bolts to the specified torque.

NOTE: Do not rotate the crankshaft while the Plastigage is in position.

(d) Remove the cap bolts and carefully detach the cap and lower half bearing.

(e) With the Plastigage scale, measure the compressed Plastigage strip to determine the clearance.



Method of checking crankshaft end float with feeler gauges.

(f) The widest point of the strip will indicate the minimum clearance and the narrowest point the maximum clearance.

(g) The remaining bearings can be checked in turn using the same procedure.

(9) Carefully lift the crankshaft from the crankcase using care not to dislodge or damage the upper halves of the main bearing shells if they are to be used again.

(10) If new bearing shells are to be installed, remove the upper halves of the bearings from the crankcase.

TO CHECK AND INSPECT

After thoroughly cleaning the crankshaft in a suitable solvent and drying it off with compressed air, blow out all the oilways and make the following checks:

(1) Check and measure the main bearing journals and crankpins for wear, taper and scoring. If wear is excessive, the journals and/or crankpins should be reground to accommodate the nearest undersize bearing shells.

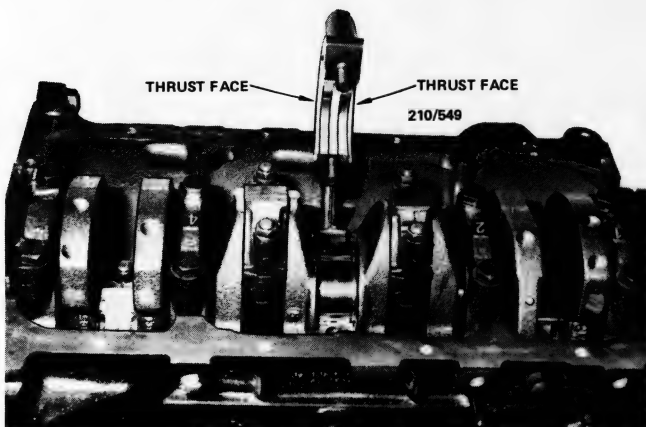
One worn or damaged journal or crankpin will necessitate the grinding of all journals or crankpins and the fitting of new undersize bearing shells.

If wear or damage is such that the journals or crankpins cannot be reground to take any one range of the available undersize bearings, then the crankshaft will have to be renewed.

(2) Support the crankshaft at each end in V blocks and with a dial gauge check the crankshaft for bend at the centre main journal. Renew the crankshaft if the bend is in excess of the allowable limit. (See Specifications.)

(3) Check the centre main bearing thrust faces for pitting or wear. If pitting or wear is evident, renew the centre main bearing shells which should bring crankshaft end float back to Specifications.

(4) Even when main bearing clearance has been found to be satisfactory, inspect the bearing shells for scores, flaking and pitting. Replace as necessary with new pairs of shells of the appropriate size.



Centre main bearing removed showing location of the thrust faces.

TO INSTALL

Installation is a reversal of the removal procedure with attention to the following points:

(1) Ensure that all the oil ways are clear and that all journals and crankpins have been thoroughly cleaned. Ensure that the new or original bearing shells have been cleaned and then smeared with new engine oil and that they are correctly positioned in their respective web, connecting rod or cap.

(2) Carefully place the crankshaft in position in the cylinder block and guide the connecting rods to their respective crankpins.

(3) If new bearing shells were installed recheck the bearing clearance using the Plastigage method as previously described.

(4) Fit the rear main bearing cap into position and inject Silastic 732 into the grooves in the side of the rear bearing cap. Fill the grooves until the Silastic appears at the inner, lower edge of the bearing cap to block joint. Install the bearing cap bolts and tighten to Specifications.

(5) Tighten the remaining main bearing cap bolts and the connecting rod cap nuts to their respective tensions and rotate the crankshaft to check for binding.

(6) Install the crankshaft oil seal to the end of the crankshaft after applying grease to the lip of the oil seal. Ensure that the open end of the seal is facing toward the engine.

(7) Install the remainder of the engine components following the procedures laid down under the relevant headings.

TO RENEW MAIN BEARINGS - CRANKSHAFT INSTALLED

(1) Remove the automatic transaxle or manual transaxle as described in the appropriate section.

NOTE: On manual transmission vehicles, a special tool is available to install the rear crankshaft oil seal with the transaxle installed. Therefore if this tool is available it will not be necessary to remove the transaxle.

(2) Remove the flywheel/drive plate as outlined under the Flywheel/Drive Plate heading.

(3) Remove the engine sump and oil pump pick up tube as previously described.

(4) Ensure that the main bearing caps are numbered to ensure correct assembly.

(5) Remove the main bearing cap bolts and remove the bearing cap and half shell of the bearing to be replaced. Thoroughly clean the bearing cap in a suitable solvent.

(6) Where necessary use the Plastigage method to measure the bearing clearance.

(7) Position a piece of Plastigage the approximate length of the bearing width, across the bearing shell in the cap and tighten the cap bolts to the specified torque. Do not rotate the crankshaft.

(8) Remove the bearing cap and measure the spread width of Plastigage with the scale on the packet to determine the main bearing clearance. Compare the measurement to Specifications and if the bearing clearance exceeds the limit instal new bearing shells.

NOTE: Renew one bearing at a time, leaving the others securely attached.

(9) Instal a suitable brass rivet in the crankshaft journal oil drilling and rotate the crankshaft in a clockwise direction until the head of the rivet contacts the plain edge of the upper bearing shell.

(10) Continue to rotate the crankshaft to carry the upper half of the bearing shell out of the crankcase.

(11) Select a half shell of the required thickness (standard or undersize), coat it liberally with clean engine oil and start it, plain edge first into position on the crankshaft. Rotate the crankshaft anti-clockwise so that the rivet contacts the locating lug edge of the bearing shell, carrying it into position in the crankcase above the main bearing journal. Slightly reverse the rotation of the crankshaft and remove the rivet from the oil drilling in the crankshaft.

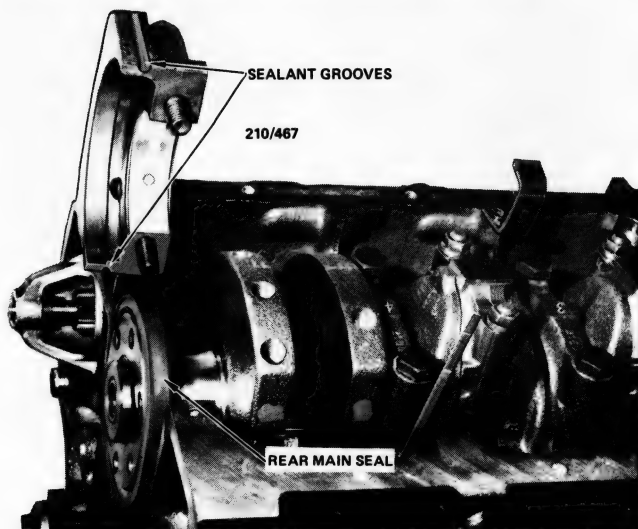
(12) Place the other half shell of the selected bearing shells in the bearing cap, checking the clearance as detailed in operations (7) and (8).

NOTE: By checking the taper on the Plastigage any taper of the bearing journal can be calculated.

(13) When the bearing has been correctly selected to give the specified clearance, tighten the cap bolts to the specified torque.

(14) Use the same method to renew the other main bearings.

(15) When renewing the rear main bearings, remove and discard the rear crankshaft oil seal.



Rear main bearing cap removed showing location of rear seal and sealant grooves.

Fit the rear main bearing cap into position and inject Silastic 732 into the grooves in the sides of the rear bearing cap. Fill the grooves until the Silastic appears at the inner lower edge of the bearing cap to block joint. Instal the bearing cap bolts and tighten to Specifications.

Lubricate the lip of the new oil seal with Shell Alvania 3 and carefully instal the seal into position over the crankshaft. Insert the seal as far as possible using finger pressure, fully instal the seal using a suitable tubular drift. Ensure that the seal is not damaged during installation and that the seal is mounted square to the block face.

(16) Instal the remainder of the engine components following the procedures laid down under the relevant headings.

TO RENEW CRANKSHAFT OIL SEALS

Front

To renew the front crankshaft oil seal, refer to the Oil Pump heading.

Rear

To renew the rear crankshaft oil seal, refer to the heading To Renew Main Bearings — Crankshaft Installed.

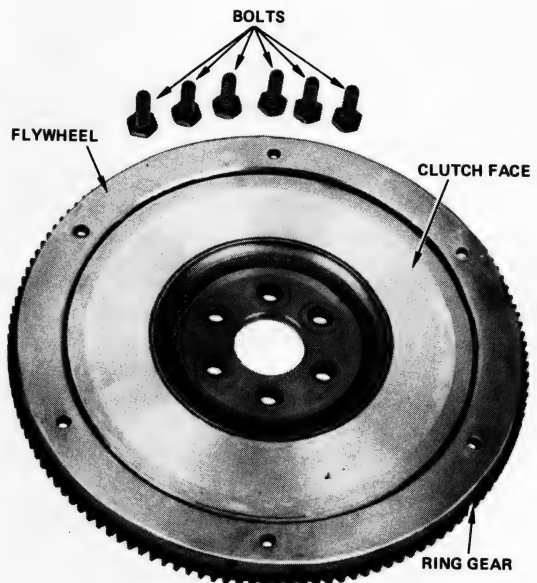
12. FLYWHEEL / DRIVE PLATE

Special Equipment Required:

To Renew Ring Gear — Suitable heat source

TO REMOVE AND INSTAL

(1) On automatic transmission models remove the transaxle assembly as outlined in the Automatic Transaxle section.



View of flywheel and retaining bolts.

(2) On manual transmission models remove the clutch assembly as outlined in the Clutch section. The flywheel can be removed through the lower clutch cover.

(3) Suitably mark the position of the flywheel or drive plate in relation to the crankshaft so that it can be installed to its original position to maintain engine balance.

(4) Remove the flywheel or drive plate retaining bolts and remove the flywheel or drive plate from the vehicle.

Installation is a reversal of the removal procedure with attention to the following points:

(1) The flywheel and drive plate retaining bolts are special micro-encapsulated fasteners.

Fit new micro-encapsulated bolts of the correct strength classification on assembly.

(2) Thoroughly clean the crankshaft threads with a thread tap. Clean the threads with a suitable solvent and blow dry before installing the flywheel or drive plate retaining bolts.

(3) Tighten the flywheel or drive plate retaining bolts to the specified torque and on manual transmission models align the clutch plate as described in the Clutch section.

TO CHECK AND INSPECT

(1) Inspect the clutch face of the flywheel for cracks or excessive scoring.

(2) Inspect the ring gear teeth for damage, cracks or wear. The ring gear on manual transmission models can be renewed separately from the flywheel but on automatic transmission models the complete drive plate must be renewed.

(3) Inspect the drive plate mounting bolt holes for wear caused by loose mounting bolts.

(4) Inspect the drive plate for cracks.

TO RENEW FLYWHEEL RING GEAR

(1) With the flywheel removed from the vehicle, drill a 6 mm diameter hole between two teeth of the ring gear.

NOTE: Do not drill right through the ring gear as this will damage the flange on the flywheel.

(2) Secure the flywheel, with the drilled hole uppermost, in a vice fitted with soft jaws.

(3) Place a cold chisel above the hole in the ring gear and hit it sharply to split the ring gear.

(4) Check the direction of the chamfered face of the old ring gear. The new ring gear must be installed to the flywheel with the chamfer in the same direction.

(5) Remove the ring gear, clean the mounting face on the flywheel and remove any burrs.

(6) Polish a few spots of the ring gear with emery cloth and heat the ring gear evenly until the polished spots turn dark blue.

NOTE: Do not heat the ring gear past the point required to achieve a dark blue colour or the tempering of the ring gear teeth will be impaired.

(7) With the flywheel suitably supported, pick the ring gear up using pliers, and place it evenly onto the flywheel. Use a hammer and a brass drift to ensure that the ring gear seats against the flywheel flange.

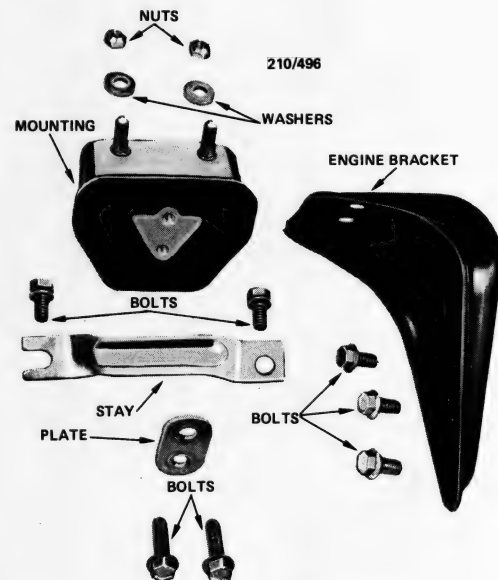
NOTE: Allow the ring gear to cool slowly. Do not quench in water.

13. ENGINE MOUNTINGS AND TORQUE DAMPER

TO RENEW RIGHT HAND FRONT MOUNTING

(1) Disconnect the negative battery terminal.

(2) Attach suitable lifting tackle to the lifting bracket adjacent to the exhaust heat stove and lift the engine slightly until the engine weight is just off the engine mounting.



Dismantled view of right hand front engine mounting assembly.

(3) Remove the two bolts securing the mounting stay to the body, below the engine mounting.

(4) Remove the two bolts securing the mounting to the engine bracket and the nuts attaching the mounting to the body and slide the mounting down and out of the vehicle.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Slide the engine mounting into position and securely tighten the mounting to engine bracket retaining bolts.

(2) Instal the nuts and washers to the engine

mounting to body retaining studs and tighten the nuts finger tight.

(3) Release the engine lifting tackle and then tighten the nuts securely, ensure that the rearmost nut is tightened first and that the mounting is not twisted or distorted after installation.

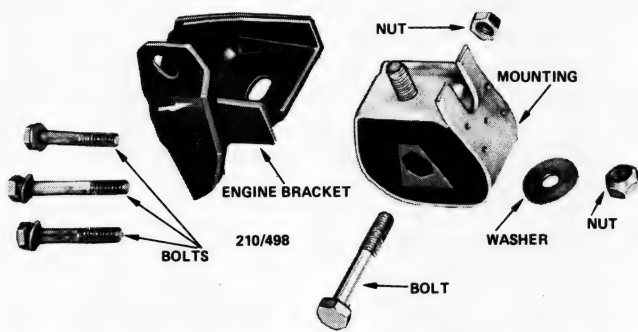
(4) On manual transmission models, check and if necessary adjust the gear selector linkage. Refer to the Manual Transaxle section under the heading Gear Selector Control Rod Assembly.

(5) On automatic transmission models, check and if necessary adjust the selector cable. Refer to the Automatic Transaxle section under the heading Transaxle Selector Cable.

TO RENEW RIGHT HAND REAR MOUNTING

(1) Disconnect the negative battery terminal.

(2) Attach suitable lifting tackle to the lifting bracket adjacent to the exhaust heat stove and lift the engine slightly until the engine weight is just off the engine mounting.



Dismantled view of right hand rear engine mounting assembly.

(3) Remove the through bolt attaching the engine mounting to the alternator bracket and the nut securing the mounting to the body support bracket.

(4) Lift the engine slightly and remove the engine mounting.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Instal the engine mounting to the alternator bracket and instal and tighten the through bolt.

(2) Instal the nut and washer to the engine mounting to body retaining stud and tighten the nut finger tight.

(3) Release the engine lifting tackle before tightening the retaining nut. Ensure that the mounting is not twisted or distorted after installation.

(4) On manual transmission models, check and if necessary adjust the gear selector linkage. Refer to the Manual Transaxle section under the heading Gear Selector Control Rod Assembly.

(5) On automatic transmission models, check and if necessary adjust the selector cable. Refer to the Automatic Transaxle section under the heading Transaxle Selector Cable.

TO RENEW LEFT HAND REAR MOUNTING

Manual Transmission Models

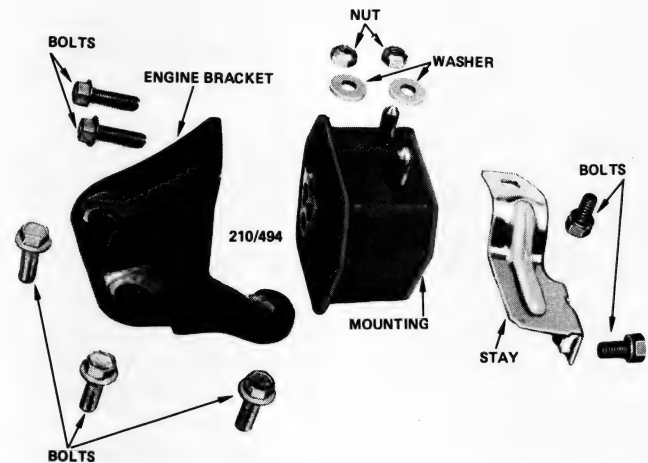
(1) Disconnect the negative battery terminal.

(2) Attach suitable lifting tackle to the lifting bracket adjacent to the distributor assembly and lift the engine slightly until the engine weight is just off the engine mounting.

(3) Remove the bolts securing the rear mounting stay to the body and lift out the stay.

(4) Remove the two bolts securing the mounting to the engine bracket and the nuts attaching the mounting to the body. Slide the mounting downward and out of the vehicle.

Installation is a reversal of the removal procedure with attention to the following points:



Dismantled view of left hand rear engine mounting assembly. Manual transmission model.

(1) Slide the engine mounting into position and securely tighten the mounting to engine bracket retaining bolts.

(2) Instal the nuts and washer to the engine mounting to body retaining studs and tighten the nuts finger tight.

(3) Release the engine lifting tackle and then tighten the nuts securely, ensuring the rearmost nut is tightened first and the mounting is not twisted or distorted after installation.

(4) Check and if necessary adjust the gear selector linkage, refer to Manual Transaxle section under the heading Gear Selector Control Rod Assembly.

Automatic Transmission Models

(1) Disconnect the negative battery terminal.

(2) Attach suitable lifting tackle to the lifting bracket adjacent to the distributor assembly and lift the engine slightly until the engine weight is just off the engine mounting.

(3) Remove the bolts securing the mounting stay to the body and lift out the stay.

(4) Remove the bolts securing the engine bracket to the transaxle assembly and the two nuts attaching the mounting to the body.

(5) Lower the engine slightly and remove the mounting and engine bracket as an assembly from the vehicle.

(6) Remove the bolts retaining the engine mounting to the engine bracket and separate the mounting and bracket.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Assemble the engine mounting to the engine bracket and securely tighten the retaining bolts.

(2) Fit the engine bracket and mounting assembly to the transaxle and tighten the mounting bolts.

(3) Instal the nuts and washers to the engine mounting to body retaining studs and tighten the nuts finger tight.

(4) Release the engine lifting tackle and tighten the nuts securely, ensuring the rearmost nut is tightened first and the mounting is not twisted or distorted after installation.

(5) Check and if necessary adjust the selector cable, refer to the Automatic Transaxle section under the heading Transaxle Selector Cable.

TO RENEW TORQUE DAMPER

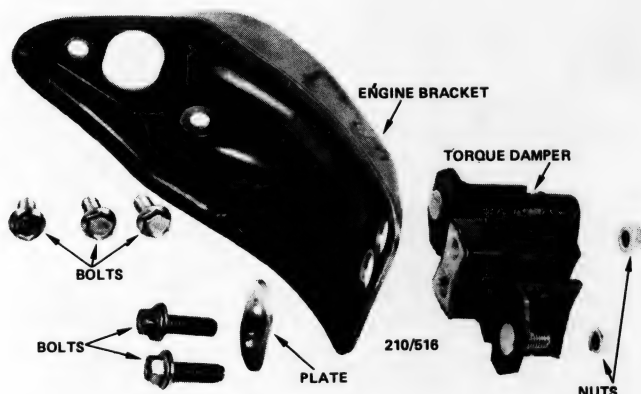
(1) Disconnect the negative battery terminal.

(2) Remove the bolts securing the torque damper to the engine bracket, and the three bolts retaining the engine bracket to the transaxle assembly, and remove the engine bracket.

(3) Remove the nuts retaining the torque damper to the body and lift out the torque damper.

Installation is a reversal of the removal procedure with attention to the following point:

After the torque damper is installed check the clearance between the base of the damper and the body bracket. The clearance must be 6.5 ± 1.0 mm. The torque damper should be in an unstressed condition while the engine is stopped.



View of torque damper and engine bracket.

14. EXHAUST SYSTEM

TO REMOVE

(1) Raise the front and rear of the vehicle and support it on chassis stands. Refer to the Wheels and Tyres section for the correct procedure.

(2) Remove the nuts and remove the clamp holding the rear muffler and tailpipe to the intermediate pipe.

(3) Bend both tabs on the rear muffler and tailpipe brackets in towards the centre of the rubber insulators and remove the insulators.

(4) Withdraw the rear muffler and tailpipe from the intermediate pipe.

(5) Remove the two bolts and springs securing the intermediate pipe to the engine pipe flexible joint.

(6) Unhook the two insulators from the intermediate pipe support bracket and remove the intermediate pipe from the vehicle.

(7) Remove the four nuts securing the engine pipe to the exhaust manifold flange.

(8) Remove the retaining bolts and lift out the front suspension cross brace from between the left and right hand suspension assemblies.

(9) Undo the support bracket to engine pipe retaining bolt taking care to collect the insulators and spacers.

(10) Remove the engine pipe from the vehicle and discard the flexible joint and flange gaskets.

NOTE: Should difficulty be experienced when separating the exhaust pipes, they may be cut with a hacksaw or pipe cutter when a replacement system is to be fitted. When heating 'frozen' joints to undo them, take extreme care near floor pans, fuel and brake lines or electrical wiring.

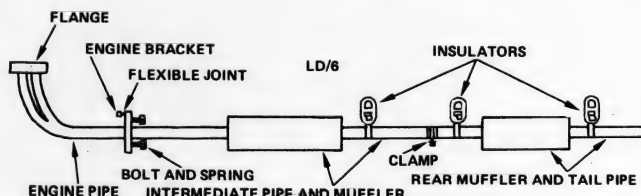
TO INSTAL

Installation is a reversal of the removal procedure with attention to the following points:

(1) Carefully inspect the exhaust system and mountings for corrosion, wear and cracks and replace any component that is suspect.

(2) Clean the exhaust manifold and front engine pipe flange and fit a new gasket to the flange and the flexible joint.

(3) Instal the front engine pipe to the exhaust manifold. Coat the threads of the flange nuts with a suitable anti-seize solution. Instal the engine pipe support



Line drawing of exhaust system.

bracket mounting bolt and insulators.

(4) Instal, but do not tighten at this stage, the intermediate pipe and muffler and the rear muffler and tail pipe.

(5) Check the system for correct positioning, ensure that all components are well clear of the underbody.

(6) Working from front to rear tighten all the exhaust components and bend back the tabs on the exhaust brackets to retain the insulators.

(7) Refit the cross brace to the front suspension.

(8) Start the engine, and check the exhaust system for leaks and knocks, then lower the vehicle to the ground.

COOLING SYSTEM

SPECIFICATIONS

Water pump type Centrifugal, non-repairable
Thermostat:

Type Wax pellet

Starts to open 91 deg C

Fully open 103 deg C

Radiator cap:

Type Pressure relief

Working pressure 120–135 kPa

Radiator type Crossflow

TORQUE WRENCH SETTINGS

Water pump to engine bolts 30 Nm

Thermostat cover bolts 9 Nm

Thermostat housing bolts 20 Nm

Thermoswitch 19 Nm

1. COOLING SYSTEM TROUBLE SHOOTING

COOLANT LEAKAGE - EXTERNAL

(1) Loose hose clips or faulty hoses: Tighten hose clips or renew faulty water hoses.

(2) Leaking radiator core or tanks: Repair or renew radiator.

(3) Leaks at heater core or tanks: Repair or renew heater core.

(4) Worn or damaged water pump seal or bearing: Renew water pump.

(5) Loose or rusted welch plugs: Renew faulty welch plugs.

(6) Leaks at thermostat housing or water pump joint 'O' ring: Renew 'O' ring.

(7) Faulty cylinder head gasket or loose cylinder head retaining bolts: Renew gasket and correctly tighten cylinder head retaining bolts.

(8) Cracked coolant transfer pipe between lower radiator hose and water pump: Check and renew pipe.

(9) Cracked surge tank: Check and renew tank.



Check the radiator hoses for deterioration and cracking.

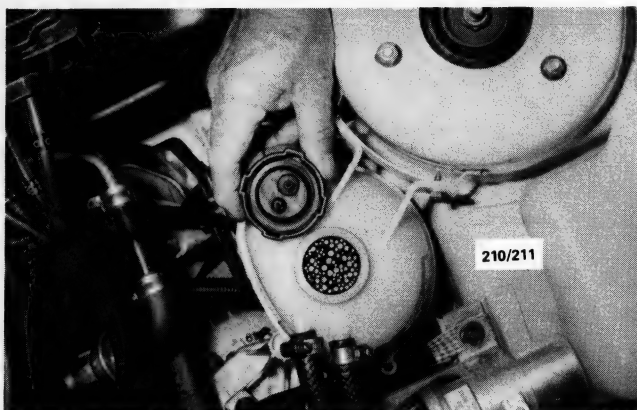
NOTE: Check system for external leakage by running vehicle engine to operating temperature over a dry floor and checking for leak source.

COOLANT LEAKAGE - INTERNAL

(1) Cylinder head gasket leak due to warped cylinder head or cylinder block gasket faces: Reface cylinder head or cylinder block. Renew cylinder head gasket.

(2) Crack in cylinder head or cylinder block: Renew cylinder head or cylinder block.

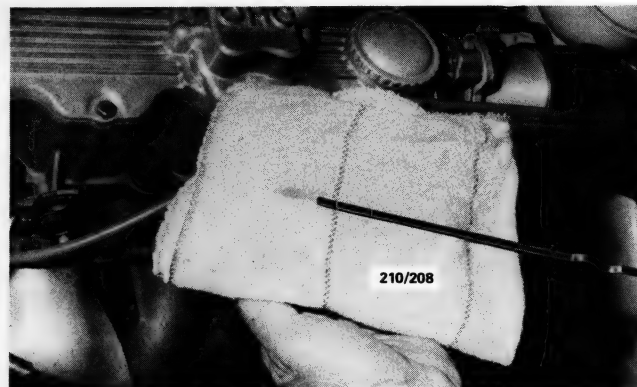
(3) Inlet manifold corroded allowing water into cylinders: Renew inlet manifold.



A blown head gasket is indicated by bubbles in the surge tank coolant.

(4) Automatic transmission cooler leaking, allowing water into transmission: Check automatic transmission oil for water contamination. If contaminated repair or renew transmission cooler. The transmission will also need attention.

NOTE: Check engine for internal leakage by withdrawing the dipstick and inspecting for emulsified oil. Also run engine and check for excessive steam and emulsified oil at exhaust pipe which would indicate water leakage into the combustion chamber.



Check the engine oil for correct level and for dilution, on the dipstick.

COOLANT LOSS BY OVERFLOW

- (1) Overfull system: Drain and refill the surge tank to 'COLD' level mark.
- (2) Faulty surge tank pressure cap: Renew faulty cap.
- (3) Blocked radiator core tubes: Clean or renew radiator.
- (4) Coolant foaming due to poor quality anti-freeze or corrosion inhibitor: Drain system and renew coolant and additive.

ENGINE OVERHEATING

- (1) Obstructed air passage through radiator core from front to rear: Blow out obstruction from rear to front of radiator core with compressed air or water pressure.
- (2) Incorrect ignition timing: Check and reset ignition timing as described in the Engine Tune-up section.
- (3) Poor circulation: Check and rectify as under Coolant Circulation Faulty.
- (4) Loss of coolant due to overflow: Check and rectify as under Coolant Loss by Overflow.



Renew the surge tank pressure cap if the sealing quality of the sealing rubber is suspect. Also check the pressure and vacuum relief valves.

- (5) Faulty thermostat: Check and renew thermostat.
- (6) Restricted muffler or damaged tail pipe, accompanied by loss of power: Remove restrictions or renew components.
- (7) Incorrectly adjusted or dragging brakes: Check and rectify by adjustment or renewal of components.
- (8) Low engine oil level: Stop engine immediately and replenish oil in the sump.
- (9) Engine tight after overhaul: Stop engine and allow to cool off.
- (10) Incorrect valve timing: Reset valve timing as described in the Engine section.
- (11) Faulty thermoswitch: Check and renew switch.
- (12) Faulty radiator fan motor or wiring: Check

electrical wiring and fan motor. Repair or renew as necessary.

- (13) Faulty temperature gauge and/or sending unit: Check and rectify as necessary.

NOTE: Engine overheating is indicated by excessive rise in engine temperature shown by the gauge. Overheating is usually accompanied by loss of engine power. A blown head gasket is indicated by bubbles in the surge tank.

COOLANT CIRCULATION FAULTY

- (1) Partial blockage of radiator core tubes: Reverse flush or renew radiator.
- (2) Water sludge deposits in engine water jackets: Clean and flush engine water jacket and add rust inhibitor to coolant.
- (3) Faulty water pump or thermostat: Renew water pump or thermostat.
- (4) Collapsing lower radiator hose: Check and renew lower radiator hose and check the radiator core tubes.
- (5) Insufficient coolant in system: Replenish coolant and check for leaks.

NOTE: This condition is best checked out by removing the surge tank pressure cap and running engine to check for water turbulence at part throttle. Check radiator tubes for blockage by partially draining the system and then visually checking for rust scale in the tubes. As most adverse conditions can be caused by more than one fault, diagnosis can only be made after checking out items by process of elimination in the order shown.

2. DESCRIPTION

The cooling system is of the sealed, pressurised type with fan and water pump assistance. The system is pressurised in order to raise the boiling point of the coolant and so increase the efficiency of the engine. Provision for pressure and vacuum relief of the system is incorporated in the surge tank filler cap. The operating temperature of the cooling system is controlled by a thermostat located in the thermostat housing attached to the cylinder head. An anti-corrosion inhibitor should always be added to the coolant to protect the cooling and heating systems from corrosion.

The water pump is mounted to the front of the engine and is driven by the camshaft drive belt. It is fitted with a double row ball bearing and a spring loaded seal assembly. The water pump is a disposable unit and thus can not be repaired.

The fan is driven by a fan motor which is actuated by a thermoswitch located in the radiator. A fan shroud is provided to help the flow of air through the radiator.

On vehicles with automatic transmission the radiator also houses the transmission oil cooler. To drain the radiator it is necessary to remove the bottom hose from the radiator.

3. RADIATOR

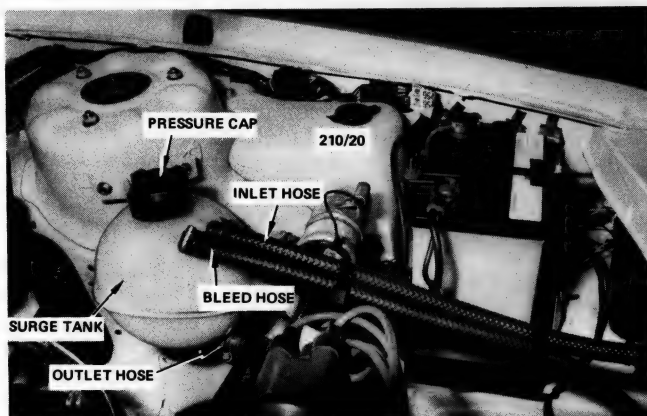
NOTE: To avoid scalding, use caution when releasing the surge tank pressure cap on an engine which is running at normal operating temperature. Switch off the engine and allow the engine to cool. Turn the pressure cap a quarter to half a turn anti-clockwise and allow any pressure in the surge tank to release.

TO DRAIN AND REFILL

- (1) Place the heater control lever in the maximum heat position.
- (2) Place a suitable drain tin below the radiator, loosen the bottom radiator hose retaining clip and carefully disconnect the bottom radiator hose from the radiator.

NOTE: It will be best to leave the surge tank pressure cap in position during this operation. This will cause a partial vacuum in the radiator therefore avoiding heavy gushes of coolant when the bottom hose is removed. When the flow of coolant stops, the surge tank cap may be opened a little at a time until all the coolant has drained from the radiator.

- (3) Place the drain tin below the surge tank, loosen the clip retaining the lower hose to the surge tank and disconnect the lower hose.
- (4) Drain the coolant from the surge tank into the drain tin.
- (5) Loosen the clips retaining the two upper hoses to the surge tank and disconnect the hoses.
- (6) Remove the bolts securing the surge tank to the vehicle body and lift the surge tank clear of the vehicle.



Installed view of the cooling system surge tank.

(7) Clean the interior of the surge tank and reinstall. Install the hoses to the surge tank and tighten the retaining clips securely.

(8) Reconnect the bottom radiator hose.

(9) Slowly fill the system with a mixture of clean water and a suitable corrosion inhibitor or anti-freeze using the quantity and procedure in the manufacturer's instructions.

(10) Fill the system until the coolant level settles down to slightly above the 'COLD' level mark on the surge tank.

NOTE: Ensure that the heater control lever is still in the maximum heat position.

(11) Start the engine and allow it to reach normal operating temperature, adding coolant to the surge tank as needed to keep the coolant at the above mentioned level. Check all hoses for leaks.

NOTE: During the engine warm-up period air in the cooling system will be dispensed of via the bleed hose into the surge tank. The coolant level therefore will drop until such time no more trapped air is in the system.

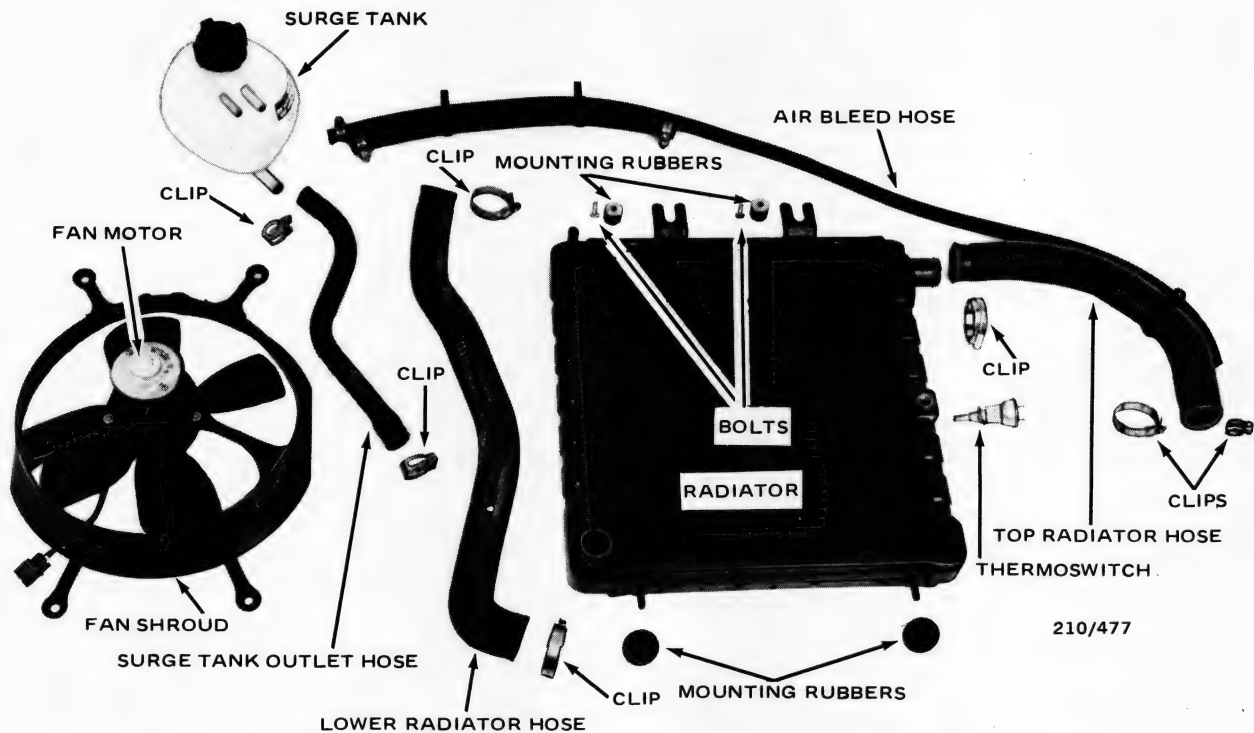
(12) As soon as a steady flow of coolant without air bubbles comes from the bleed hose, switch off the engine and let the engine cool down.

(13) Finally recheck the coolant level in the surge tank and top up if necessary. Securely install the surge tank pressure cap.

TO REMOVE

WARNING: To prevent scalding the removal of the radiator is best done when the coolant is in a cool or cold state and there is no pressure in the radiator.

- (1) Disconnect the negative battery terminal.
- (2) Drain the radiator as previously described.
- (3) Disconnect the radiator to surge tank hose from the radiator.
- (4) Disconnect the thermoswitch wire and the fan motor wires at their connectors.
- (5) Remove the bolts and washers retaining the fan motor and shroud assembly to the radiator and remove the assembly from the vehicle.
- (6) On vehicles fitted with automatic transmission disconnect the oil cooler hoses from the radiator side tank. Place a suitable container beneath the radiator to collect any flow of transmission fluid from the pipes or the radiator tank. Plug the hoses and the hose unions on the radiator to prevent loss of fluid and entry of dirt.
- (7) Loosen the hose clip and disconnect the top radiator hose from the radiator.
- (8) Remove the bolts and washers retaining the top of the radiator to the vehicle body frame.
- (9) Lift the radiator upwards to disengage the



View of radiator and associated components removed from the vehicle.

radiator lower locating pins from their mounting rubbers and withdraw the radiator from the vehicle.

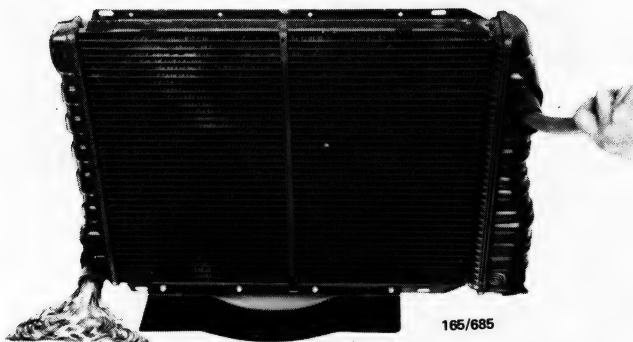
(10) Inspect the upper and lower radiator mounting rubbers for wear and deterioration and renew if necessary. Using a suitable blunt tool the lower radiator mounting rubbers can easily be prised out of the body panel.

NOTE: When a radiator that has been in use for some time is removed from the vehicle to enable repairs to be carried out on the engine, it should not be allowed to stand empty for any length of time. The radiator should be immersed in a tank of water or otherwise kept full. Failure to observe this precaution may result in overheating when the engine is put back into service. This is caused by internal deposits in the radiator drying and flaking and

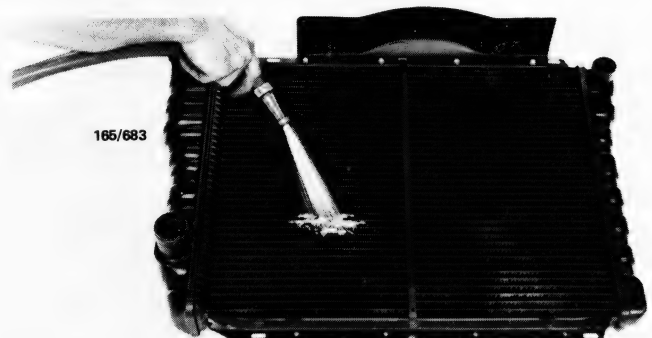
so obstructing the circulation of the coolant in the system. Care must be taken not to damage the radiator core or tanks in any way.

TO FLUSH AND CLEAN

- (1) Remove the radiator as previously described.
- (2) Stand the radiator upside down and apply a water hose to the radiator outlet and reverse flush the radiator until the water flowing from it is clean.
- (3) Turn the radiator upright and apply a stream of water or compressed air to the radiator core from rear to front. Maintain this procedure until all dirt and foreign matter is removed from the radiator core.
- (4) With the aid of a light make a visual check down through the radiator water inlet and outlet onto the radiator tubes. If it is apparent that the tubes are severely



Reverse flush the radiator using water pressure.



Clean obstructions from radiator core using water pressure.

impregnated with flakes of rust it will be necessary to have the upper and lower radiator tanks separated from the radiator core and the tubes thoroughly cleaned. It is recommended that this operation be carried out by a radiator specialist who has the necessary equipment to carry out this type of work.

TO INSTAL

Installation is a reversal of the removal procedure with attention to the following points:

(1) Position the radiator assembly in the front panel opening and check that the lower mounting pins are located correctly in the lower mounting rubbers then instal and tighten the upper mounting bolts.

(2) Instal the fan and shroud assembly ensuring that the bleed hose is positioned between the radiator and the fan and shroud assembly.

(3) On automatic transmission models remove the plugs from the transmission cooler hoses and unions and connect the hoses to the radiator.

(4) Reconnect the thermoswitch and the fan motor wire connectors.

NOTE: *Inspect all hoses for cracking or perishing and renew if unserviceable.*

(5) Instal all hoses preferably with a light smear of grease.

(6) Connect the negative battery terminal.

(7) Refill the cooling system as previously described and check for coolant leaks.

(8) Check the automatic transmission fluid level where applicable. If necessary refer to the Automatic Transmission section for the correct procedure. Check for fluid leaks.

4. FAN AND MOTOR ASSEMBLY

For the removal and checking procedure regarding the cooling system fan and motor assembly and the thermoswitch refer to the appropriate heading in the Electrical System section.

5. THERMOSTAT

Special Equipment Required:

To Test Thermostat - Thermometer

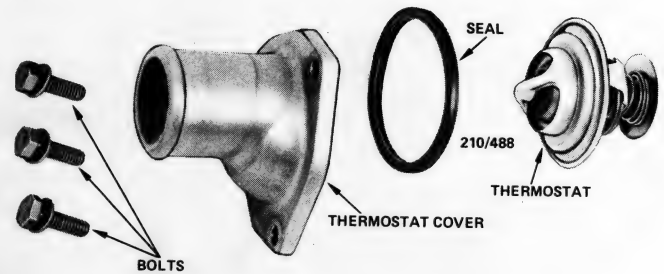
TO REMOVE AND INSTAL

(1) Drain the cooling system as previously described.

(2) Remove the air cleaner assembly from the engine as described in the Fuel System section under the heading Air Cleaner.

(3) Disconnect the top radiator hose from the thermostat cover.

(4) Remove the bolts retaining the thermostat cover to the thermostat housing.



View of thermostat and components.

(5) Detach the thermostat cover from the thermostat housing then withdraw the thermostat and the seal ring type gasket from the recess in the thermostat housing.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Ensure that all seal ring faces are clean.

(2) Use a new seal ring and coat the seal ring with a suitable sealant prior to installation.

(3) Tighten the thermostat cover retaining bolts to Specifications.

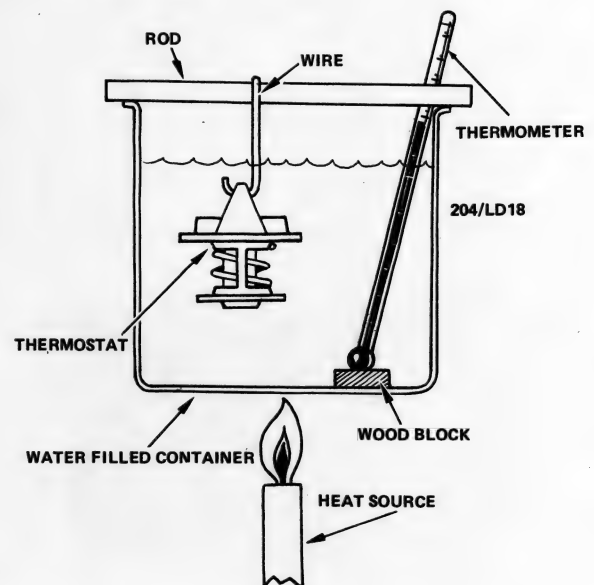
(4) Connect the top radiator hose to the thermostat cover.

(5) Instal the air cleaner assembly.

(6) Refill the cooling system as previously described ensuring the heater control lever is in the maximum heat position. Check for coolant leaks.

TO CHECK

NOTE: *A visual examination of the thermostat will often determine its serviceability and obviate the necessity for further testing. For instance, a thermostat with its valve fully*



Line drawing showing the correct method used to test a thermostat.

open when removed from a cold engine is obviously faulty and should be discarded and a new unit fitted.

- (1) Check that the thermostat is closed when cold.
- (2) Suspend and immerse the thermostat together with a reliable thermometer in a vessel of 50/50 mixture glycol and cold water, ensuring that neither the thermostat or thermometer is touching the sides or bottom of the vessel.

(3) Progressively heat the mixture noting the temperature reading on the thermometer as the thermostat valve commences to open and when it is fully open.

See Specifications for opening and fully open temperatures.

A thermostat which is not opening and is not open at the specified temperatures should be renewed.

6. WATER PUMP

Special Equipment Required:

To Adjust Drive Belt - Adjusting tool

TO REMOVE AND INSTAL

NOTE: The water pump is a non-repairable unit and if in any way faulty must be renewed as a complete assembly.

- (1) Drain the cooling system as previously described.

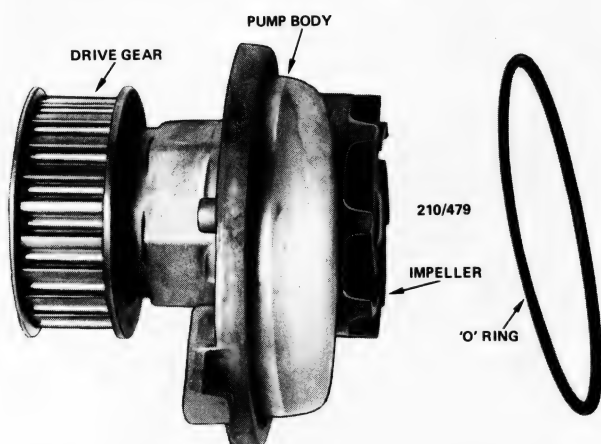
(2) Remove the camshaft gear drive belt as described in the Engine section under the heading Camshaft Drive Belt.

(3) Remove the bolts retaining the camshaft gear drive belt rear cover to the cylinder block and remove the rear cover.

(4) Remove the water pump retaining bolts and remove the water pump and the 'O' ring from the engine.

Installation is a reversal of the removal procedure with attention to the following points:

- (1) Ensure that all mounting faces are clean.



View of water pump assembly removed from engine.

- (2) Use a new 'O' ring and smear with a small amount of petroleum jelly.

(3) Instal the water pump to the engine but do not tighten the retaining bolts until the camshaft gear drive belt has been installed and tensioned correctly as described in the Engine section under the heading Camshaft Drive Belt.

- (4) Refill the cooling system as previously described in this section and check for coolant leaks.

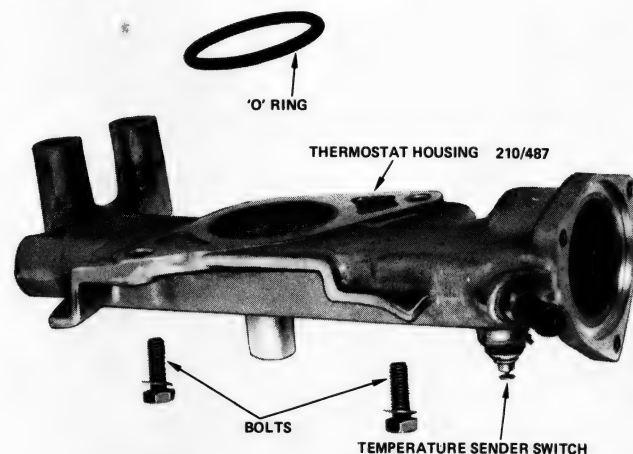
7. THERMOSTAT HOUSING

Special Equipment Required:

To Adjust Drive Belt - Adjusting tool

TO REMOVE AND INSTAL

- (1) Disconnect the negative battery terminal.
- (2) Remove the air cleaner assembly from the engine. If necessary refer to the Fuel System section.
- (3) Drain the cooling system as previously described.
- (4) Remove the camshaft gear drive belt as described in the Engine section under the heading Camshaft Drive Belt.



View of thermostat housing and components.

- (5) Remove the bolts retaining the camshaft gear drive belt rear cover to the cylinder block and remove the rear cover.

(6) Disconnect the following hoses from the thermostat housing, the top radiator hose, the bleed hose, the heater hose and the inlet manifold heater hose.

(7) Disconnect the wire from the temperature sender switch.

(8) Remove the bolts retaining the thermostat housing to the cylinder head and remove the thermostat housing and the 'O' ring from the cylinder head.

Installation is a reversal of the removal procedure with attention to the following points.

- (1) Ensure that all mounting faces are clean.
- (2) Use a new 'O' ring on installation.

(3) Tighten the thermostat housing retaining bolts to Specifications.

(4) Adjust the camshaft gear drive belt tension as described in the Engine section under the heading Camshaft Drive Belt.

(5) Refill the cooling system as previously described and check for coolant leaks.

8. WELCH PLUGS

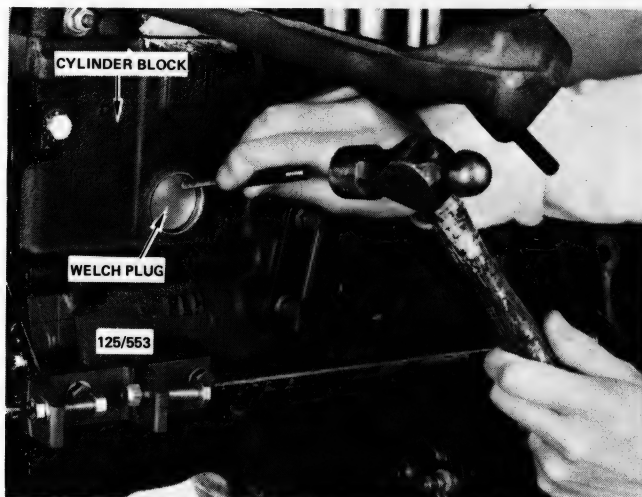
To facilitate the casting of the cylinder block and cylinder head passages and water jackets a number of openings had to be made at manufacture.

These openings are plugged with welch plugs. The plugs may have to be renewed when cleaning the engine water jackets or when the plugs become defective due to corrosion.

TO RENEW

NOTE: If a welch plug is found to be defective, it is good policy to renew all welch plugs.

- (1) Drain the radiator and cylinder block.
- (2) Remove the necessary engine components or accessories to gain ample working space around the plug.



Tap the welch plug on its outer circumference into cylinder block. Typical.

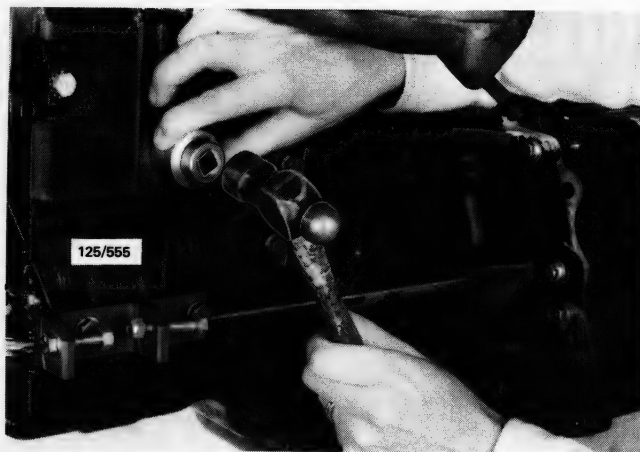
(3) Use a suitable punch and hammer and tap the welch plug on its outer circumference into its opening.

(4) Grasp the edge of the welch plug with a pair of multigrip pliers and using the shoulder of the multigrip pliers, lever the plug out of its opening.

(5) Thoroughly clean and dry the welch plug opening.

(6) Lightly smear the edge of a new welch plug and the opening with 'Stag' jointing compound.

(7) Place the welch plug onto the opening and using a suitable tube or socket fitting the rim of the plug, drive the plug squarely into its opening.



Using a correct fitting tube or socket, drive the welch plug into its opening. Typical.

NOTE: The plug must be driven into the opening straight and squarely or leaks may occur.

(8) Install the components which were removed to gain access to the plug.

(9) Fill the cooling system as previously described. With the surge tank pressure cap installed run the engine until it reaches normal operating temperature and check for coolant leaks.

9. HEATER UNIT, WATER VALVE AND CONTROLS

TO REMOVE AND INSTALL HEATER UNIT

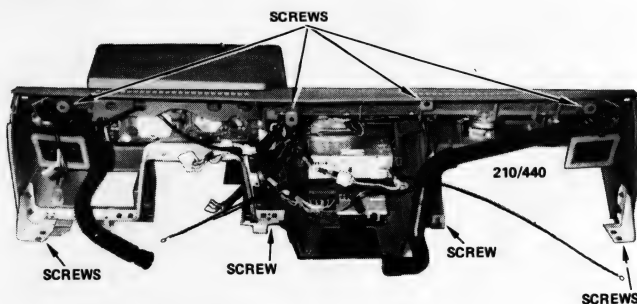
(1) Raise the engine bonnet and fit fender covers to both front fenders.

(2) Disconnect the negative battery terminal.

(3) Drain the cooling system via the lower radiator hose as previously described.

(4) Remove the screws retaining the lower trim panels and remove the trim panels from the instrument panel.

(5) Remove the screws which retain the glove compartment assembly to the instrument panel support brackets and withdraw the glove compartment from the instrument panel.



Rear view of instrument panel showing the location of the mounting screws.

(6) Remove the parcel tray retaining screws and remove the parcel tray.

(7) Mark the installed position of each heater control cable at the heater unit and disconnect the cables from the heater unit.

(8) Disconnect the vent control cable from the heater air inlet duct at the upper left hand side of the bulkhead after marking its installed position.

(9) From beneath the steering column remove the lower vent panel retaining screws and remove the lower vent panel if so equipped.

(10) Remove the steering column upper and lower mounting bolts, gently pivot the steering column downwards and allow the steering wheel to rest on the front seat.

(11) Remove the fuse box cover from the fuse box.

(12) Remove the fuse box retaining screws, pull the fuse box forwards a short distance then turn the fuse box sideways about 45 degrees and push the fuse box inwards through its aperture.

NOTE: To make this operation easier remove the four relays from the fuse box temporarily. The relays are interchangeable and can be installed in any sequence.

(13) Squeeze the locking tab on the speedometer cable retainer at the speedometer head and pull the speedometer cable off the speedometer head.

(14) Using a suitable screwdriver carefully prise off the short vent cover from the upper right hand side corner of the instrument panel and the long vent cover from the upper left hand side of the instrument panel.

(15) Remove the remaining instrument panel retaining screws and disconnect the round heater air ducts from the heater unit.

(16) Squarely withdraw the instrument panel from its mounted position a short distance, disconnect the radio antenna from the connector and disconnect the main wiring loom connectors.

(17) Fully withdraw the instrument panel from the vehicle.

(18) Disconnect the left and right hand side square air ducts from the heater unit.

(19) Remove the screws retaining the left and right hand side demister ducts to the bulkhead. Remove the demister ducts from the bulkhead.

(20) Disconnect the vacuum hoses from the heater water valve and the inlet manifold connection.

(21) Working inside the engine compartment disconnect the two heater hoses from the heater core tubes ensuring not to strain the two heater core tubes. If necessary cut the heater hoses.

(22) Remove the nuts securing the emission control vacuum control module to the bulkhead brackets. Place the control module aside.

(23) Remove the heater unit two upper retaining nuts at the bulkhead.

(24) From inside the vehicle remove the heater unit upper and lower retaining screws and withdraw the heater unit from the vehicle.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Check the condition of the heater core water tubes grommet on the heater unit for damage or deterioration and if necessary remove and renew the grommet.

(2) Check that all duct seals are in a serviceable condition and securely glued to the heater unit.

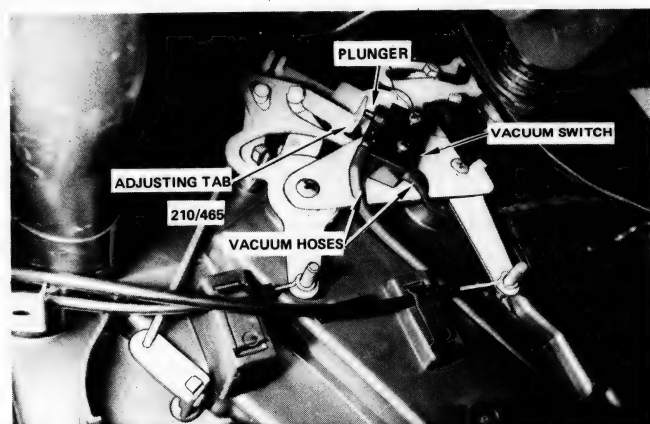
(3) Ensure that the heater hoses are correctly installed to their original position.

(4) As each control cable is connected to its respective lever on the heater unit and vent control, ensure that the control levers and cables move freely without binding and that the control levers do not foul on either end of the slots in the control panel before the valve it operates is either fully open or closed.

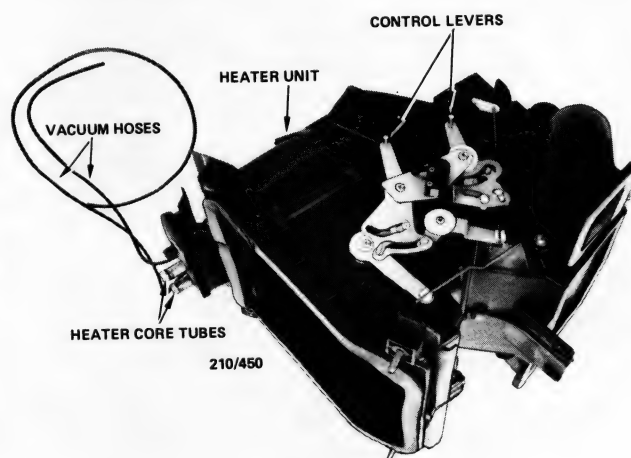
(5) Check that the wires or wire connectors are not interfering with any components.

(6) Fill the cooling system as described previously in this section.

(7) With the engine at operating temperature check for coolant leaks.



Installed view of heater unit water valve vacuum switch.



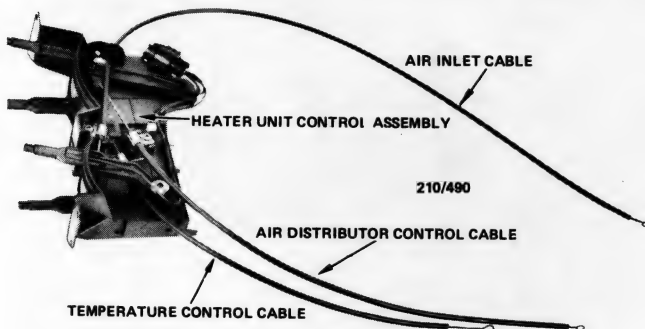
View of heater unit removed from vehicle.

TO REMOVE AND INSTAL HEATER CONTROLS

- (1) Remove the radio control knobs by pulling them off their spindles.
- (2) Remove the nuts and washers retaining the radio facia bezel to the radio.
- (3) Carefully prise the radio facia bezel away from the instrument panel enough to gain access to and disconnect the illumination lamp bulb holders from the rear of the radio facia bezel. Remove the facia bezel from the instrument panel.
- (4) Remove the screws retaining the radio to the instrument panel and withdraw the radio enough to gain access to and disconnect the wire connectors and the radio antenna connector. Remove the radio from the instrument panel.
- (5) Pull the heater control lever knobs off the control levers.
- (6) Using a blunt tool gently prise the heater control indicator panel and surround off the instrument panel and disconnect the illumination lamp bulb holder from the surround.
- (7) Remove the screws securing the heater control assembly to the instrument panel.
- (8) Remove the screws retaining the glove compartment and the left and right hand side lower trim panels to the instrument panel. Remove the glove compartment and both lower trim panels.
- (9) Mark the installed position of each heater control cable at the heater unit and at the heater air inlet duct. Disconnect the cables from their respective levers.
- (10) Withdraw the heater control assembly a short distance from the instrument panel, disconnect the heater fan switch multi-pin wire connector and the illumination lamp bulb holder from the heater control assembly.
- (11) Remove the heater control assembly from the instrument panel.

Installation is a reversal of the removal procedure with attention to the following points.

- (1) Connect the heater control cables to their correct levers and positions as marked prior to removal.
- (2) Check the operation of each heater control cable and adjust as necessary.
- (3) Ensure that the electrical wiring is not caught or pinched in between components.



View of heater unit control assembly.

TO ADJUST CONTROL CABLES

- (1) Remove the screws retaining the left and right hand side lower trim panels to the instrument panel and remove the trim panels.
- (2) Remove the glove compartment retaining screws and remove the glove compartment from the instrument panel.

NOTE: Before carrying out the control cable adjustment procedure disconnect the cables from their respective operating levers at the heater unit and from the air inlet duct lever.

- (3) Slide the air distribution control lever on the dash control panel to the full left position.
- (4) Pull the air distribution control lever on the heater unit towards the rear of the vehicle to the limit of its travel.
- (5) Connect the inner control cable to the control lever pin.
- (6) Ensure to keep the control lever on the heater unit in its fully rearward position, gently pull on the outer heater control cable to a point when all free play on the cable has been eliminated then instal the outer cable retaining clip. Check the operation of the control cable and levers for full travel in both directions.
- (7) Slide the temperature control lever on the dash control panel to the full left position.
- (8) Pull the temperature control lever on the heater unit towards the rear of the vehicle and check if the tab on the control lever is pushing down the plunger in the water valve vacuum switch. Bend the tab on the control lever if adjustment is necessary.
- (9) Connect the inner control cable to the control lever on the heater unit, ensure the control lever is still positioned fully rearwards, pull the outer control cable to a position where no more free play is evident then secure the outer control cable with the retaining clip.
- (10) Check the operation of the control cable and the control lever for full travel in both directions.
- (11) Slide the air supply control lever on the dash control panel fully to the right.
- (12) Pull the control lever on the air direction control flap at the air inlet duct downwards to the limit of its travel.
- (13) Connect the inner control cable to the control lever pin, gently pull back on the outer control cable to remove all free play and instal the outer cable retaining clip. Check the operation of the control cable and the air flap.
- (14) Instal the components removed to gain access to the control cables.

TO REMOVE AND INSTAL HEATER WATER VALVE

- (1) Drain the cooling system as previously described.

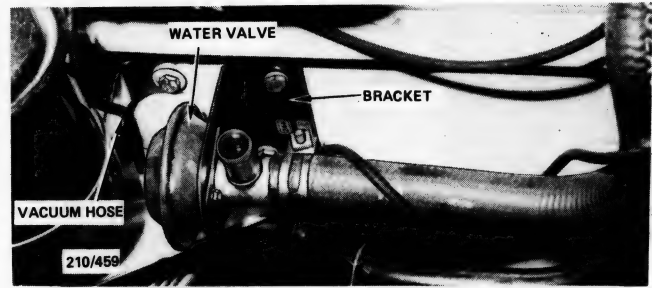
(2) Loosen the hose clips and disconnect the heater hoses from the heater water valve.

(3) Disconnect the vacuum hose from the heater water valve.

(4) Remove the bolts securing the heater water valve and the mounting bracket assembly to the lower bulkhead. Remove the heater water valve and mounting bracket assembly from the vehicle.

Installation is a reversal of the removal procedure with attention to the following point:

Fill the cooling system as previously described.



View of heater water valve installed to vehicle.

SPECIFICATIONS

CARBURETTOR

Model	Varajet II
Type	Dual barrel downdraught
Choke control	Electrically controlled automatic
Primary jet	2.04 mm
Primary metering rod	1.51 mm

NOTE: See Engine Tune-up section for engine idle speed Specifications.

FUEL PUMP

Type	Mechanical
Driven by	Camshaft
Pump pressure	22 – 26 kPa
Pump capacity	See text

1. FUEL SYSTEM TROUBLE SHOOTING

ENGINE WILL NOT START

- (1) Lack of fuel in float chamber: Check fuel pump delivery, sticking needle valve or clogged gauze fuel filter.
- (2) Engine flooded with fuel when cold, by excessive use of accelerator: Hold accelerator flat until engine starts and revise starting procedure.
- (3) Engine flooded when hot by excessive use of accelerator: Hold accelerator flat until engine starts. Also check that the choke is fully open.

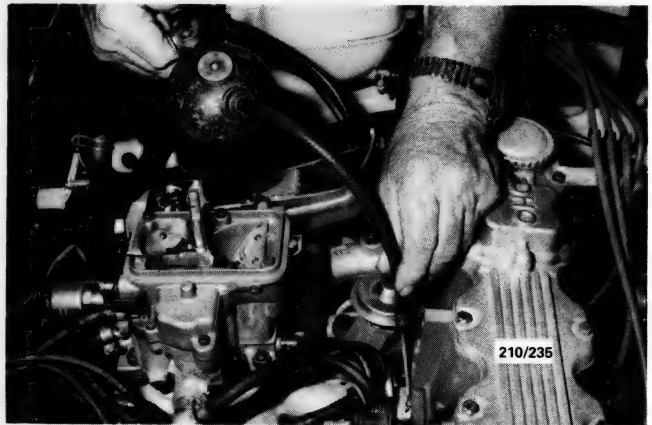
NOTE: Check for lack of fuel in float chamber by disconnecting the fuel supply line at the carburettor, inserting the line into a suitable container and an assistant cranking the engine. This also checks out the fuel pump. Engine flooding is indicated by a heavy petrol smell and fuel leaking from the carburettor throttle shaft.



Checking for fuel flow at carburettor fuel supply line.

ENGINE STALLS AT IDLE SPEED

- (1) Incorrect adjustment of idling speed: Check and adjust as described in the Engine Tune-up section.
- (2) Carburettor float bowl flooding: Check for sticking needle valve. Clean and blow out carburettor.
- (3) Carburettor starving for fuel: Check fuel delivery at needle valve. Check fuel pump.
- (4) Blocked idling tube (jet) or idle air bleed: Clean and blow out carburettor.
- (5) Carburettor to inlet manifold nuts loose: Tighten nuts and check for air leaks.



Air leaks at the inlet manifold can be checked by running engine oil around the suspect joints.

- (6) Leaking carburettor top cover or inlet manifold gaskets: Check and renew faulty gaskets.
- (7) Faulty anti dieseling solenoid or wiring: Check solenoid and electrical connections.

NOTE: Check out this condition by a process of elimination in the fault order given. Air leaks at the manifold can be checked out by running engine oil around the suspect joints with the engine running.

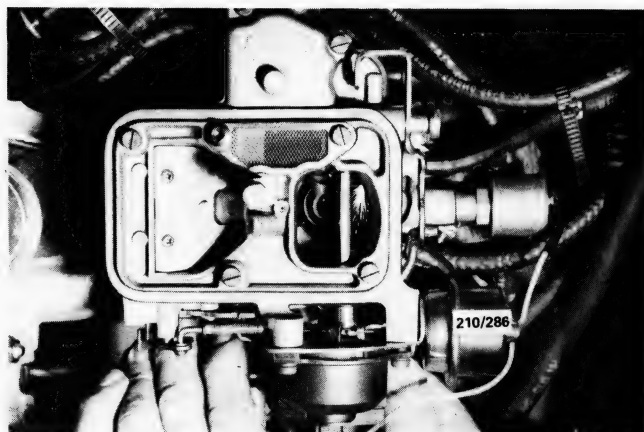
FLAT SPOT ON ACCELERATION

- (1) Blocked accelerator pump discharge nozzle or sticking check valve: Clean and blow out carburettor.
- (2) Faulty accelerator pump plunger: Instal new plunger.
- (3) Faulty accelerator pump linkage: Check and rectify linkage. Check that link is correctly set.

NOTE: Check out pump circuit by removing air cleaner and actuating accelerator linkage by hand. A squirt of fuel should be seen in the carburettor throttle bore.

ENGINE MISFIRES OR CUTS OUT AT HIGH SPEED

- (1) Obstruction in main power jets: Dismantle and blow out jets.



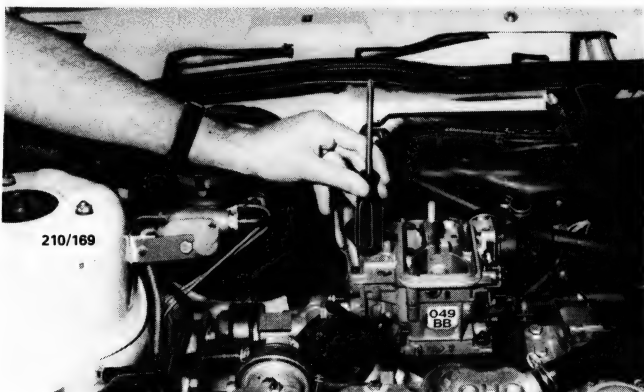
Check for discharge of fuel at accelerator pump discharge nozzle by actuating the throttle quickly by hand.

- (2) Low fuel level in float chamber or float chamber starving for fuel: Check float level setting, fuel pump, supply lines and filters.
- (3) Failure of fuel pump to deliver sufficient fuel: Renew fuel pump.
- (4) Blockage in fuel tank pipe: Remove blockage and clean pipe.
- (5) Air leak between fuel pump and tank: Rectify air leak.
- (6) Air leak between carburettor top cover and main body assemblies: Check and renew gaskets and tighten securing screws.
- (7) Water in carburettor: Drain and clean fuel system.

NOTE: Check out possible faults by a process of elimination in the fault order given. Check out fuel pump delivery pressure as outlined in the appropriate section. Check for water in float chamber and low fuel level by removing the top cover.

EXCESSIVE FUEL CONSUMPTION

- (1) Float level too high: Check and adjust float level.



Float chamber flooding can sometimes be rectified by tapping the carburettor in the vicinity of the needle valve.



When the engine is at operating temperature, the choke valve should be fully open.

- (2) Choke valve partially closed: Check and rectify choke operation.
- (3) Air cleaner element dirty: Renew air cleaner element.
- (4) Faulty fuel pump diaphragm: Renew as necessary.
- (5) Leaks between fuel pump and fuel tank or fuel pump and carburettor: Check and rectify leaks.
- (6) Worn or damaged main jets or metering rods: Check and renew faulty components.
- (7) Excessive use of accelerator pump: Revise driving habits.

NOTE: Most common causes for excessive fuel consumption are a blocked air cleaner element which can be removed and checked visually and external fuel leakage from system components which can also be checked visually.

2. CARBURETTOR

DESCRIPTION

The carburettor is a dual throat downdraught type incorporating primary and secondary systems.

Each system shares a common float chamber but has a separate main jet, metering rod, venturi and throttle valve.

The primary system provides suitable mixtures for low speeds, moderate speed and acceleration. It also provides adequate mixtures for starting when the choke valve is closed.

The secondary system, once activated, provides suitable mixtures for high speed conditions. The secondary system is activated by a linkage after opening the throttle valve approximately two thirds of its full travel. A lock out linkage prevents the secondary system being activated when the engine is cold and the automatic choke operates.

Tapered metering rods, attached to a piston in the primary metering system and to the air valve in the second-

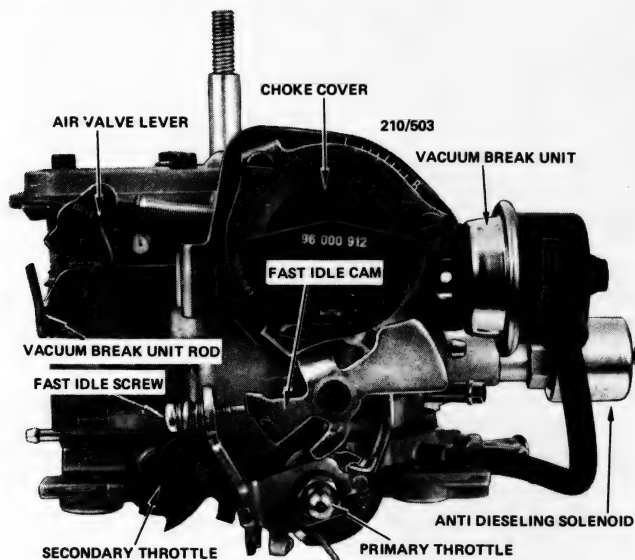
dary system govern the amount of fuel fed to the engine.

An electrically controlled automatic choke is fitted to the carburettor to assist engine starting under cold conditions. A bi-metal strip in the choke is heated by an electric heating element and governs the open position of the choke valve.

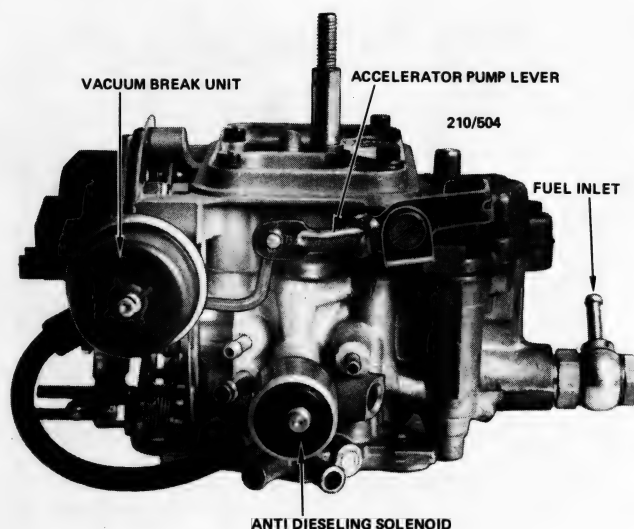
The plunger type accelerator pump supplies additional fuel to the engine for acceleration. A solenoid controlled cut off valve closes the idling by-pass system when the ignition is switched off to prevent "running on" or "dieseling" when the engine is hot.

TO REMOVE AND INSTAL

- (1) Raise the engine bonnet, fit fender covers and disconnect the battery negative terminal.
 - (2) Remove the air cleaner assembly as described under the heading Air Cleaner in this section.
 - (3) Remove the bolts securing the throttle linkage support bracket to the inlet manifold.
 - (4) Withdraw the throttle linkage support bracket from the inlet manifold, at the same time disconnect the throttle linkage from the carburettor. Leave the throttle cable, the throttle linkage and the idle load compensator attached to the throttle linkage support bracket. Place the assembly in an out of the way position.
 - (5) Disconnect the electrical wires from the automatic choke cover and from the anti dieseling solenoid.
 - (6) Mark the installed position of the emission control vacuum hoses and disconnect the hoses from the carburettor.
 - (7) Disconnect the fuel supply hose from the carburettor.
 - (8) Remove the nuts and washers retaining the carburettor to the carburettor mounting block and lift off the carburettor and the gasket.
- Installation is a reversal of the removal procedure with attention to the following points:

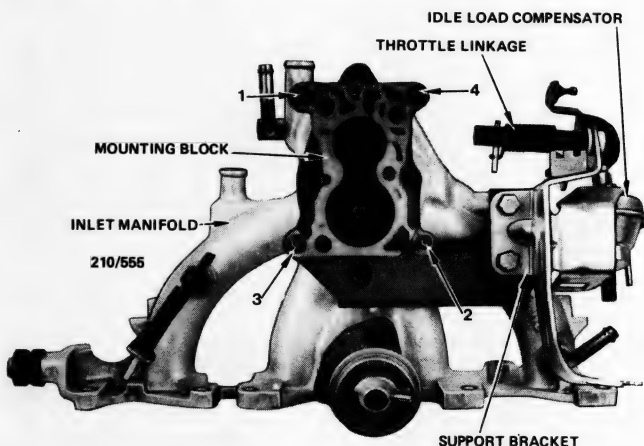


Throttle lever side view of carburettor.



Rear view of carburettor.

- (1) Use a new gasket between the carburettor and the mounting block. If necessary carefully scrape the gasket surfaces clean, making sure that no foreign matter is dropped into the inlet manifold.
- (2) Place the carburettor onto the carburettor mounting block and instal and tighten the carburettor retaining nuts in two stages, first lightly, then securely, in a diagonal fashion as shown in the illustration.
- (3) Check the carburettor for fuel and vacuum leaks and adjust the idle speeds after the engine has reached operating temperature. Refer to the Engine Tune-up section for the correct procedures.



Carburettor retaining nut tightening sequence.

TO SERVICE

When overhauling the carburettor several items of importance should be observed to ensure a thorough job.

- (1) All components should be carefully cleaned in a suitable solvent. They should then be inspected for damage or wear.
- (2) Use air pressure only to clean the various orifices and channels.

(3) Replace faulty components with new ones. When checking components removed from the carburettor it is at times difficult to be sure whether they are satisfactory for further service. It is therefore recommended that in such cases new components be installed.

(4) Always use a new gasket kit when overhauling the carburettor.

(5) Always use the correct size screwdrivers and spanners to prevent damage to the jets and screw heads.

TO DISMANTLE

(1) Remove the carburettor as previously described.

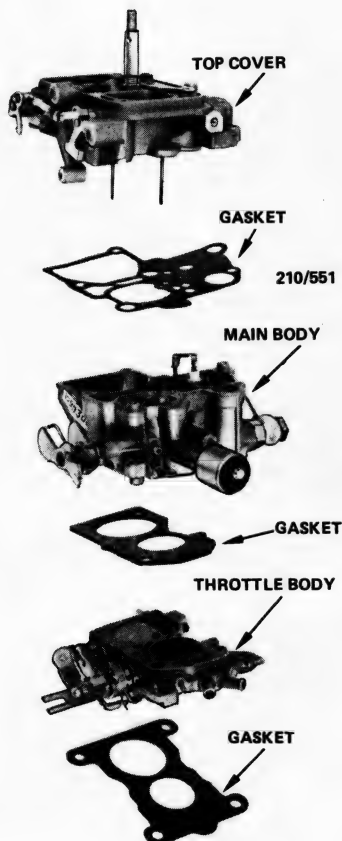
(2) Remove the fuel inlet hose adaptor, the banjo bolt and the fuel inlet filter from the carburettor.

(3) Unscrew the anti dieseling solenoid and remove the solenoid from the carburettor.

(4) Remove the three screws and, after noting the position of the index marks, withdraw the automatic choke cover assembly with the retaining ring.

(5) Disconnect the hose from the vacuum break unit and the throttle body and remove the vacuum break assembly.

(6) Remove the accelerator pump lever pivot screw and disengage the lever with the accelerator pump lever link.



Dismantled view of carburettor major sub assemblies.

NOTE: On some models, the pump lever link may be retained to the pump lever with a split pin. To disconnect the link from the lever, remove the split pin. The lever can then be left attached to the top cover.

(7) Carefully prise off the retaining clip and disconnect the choke valve link from the fast idle cam slot.

(8) Remove the screws, securing the throttle body to the main body, from the underside of the throttle body and separate the components. Discard the gasket.

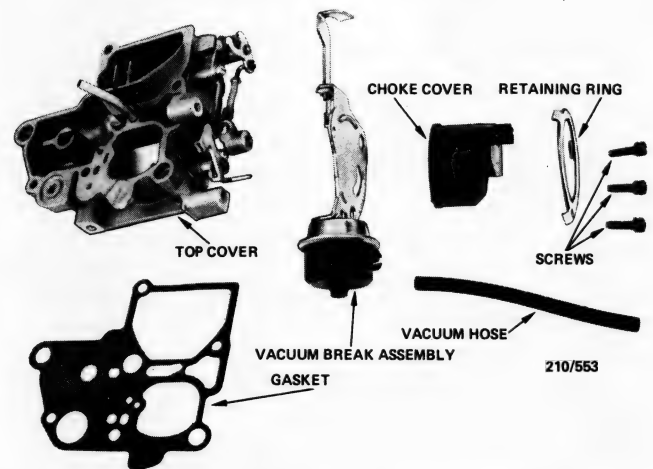
(9) Unscrew and remove the top cover retaining screws. Note the position of the long and short screws.

(10) Carefully lift the top cover from the main body. Ensure that the gasket remains on the main body and that the accelerator pump plunger, which is spring loaded, is not dislodged from its bore.

(11) Place the top cover aside ensuring not to let the top cover rest on the protruding tubes.

(12) The carburettor has now been dismantled into its three major sub assemblies, these being the top cover, the main body and the throttle body.

(13) Proceed as necessary in dismantling by referring to the individual service procedures.



Dismantled view of top cover and automatic choke components.

TO SERVICE TOP COVER

The carburettor top cover which houses the choke valve and shaft assembly, the air valve and the secondary metering jet and rod requires little attention.

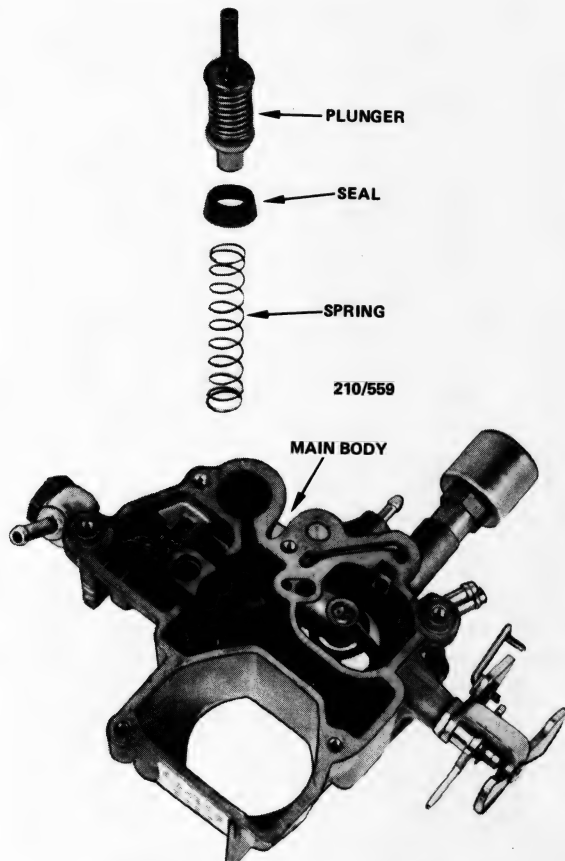
Servicing the top cover consists of a thorough general clean up and blow through with compressed air.

Free up the air valve and choke valve shaft as necessary.

NOTE: The secondary metering rod is set by the manufacturer and must not be altered.

TO SERVICE MAIN BODY

(1) Remove the accelerator pump plunger and spring.

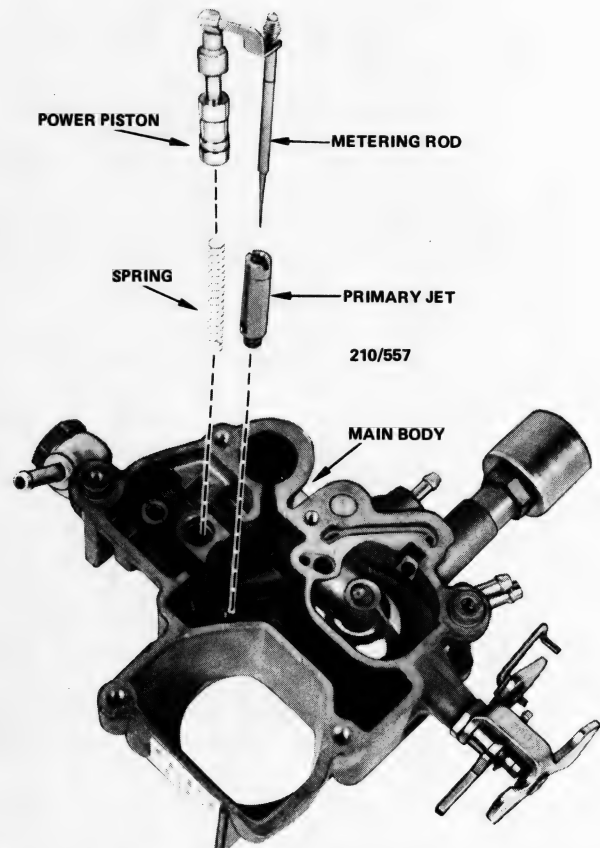


Accelerator pump plunger and spring removed from main body.

- (2) Remove and discard the top cover gasket.
- (3) Carefully withdraw the power piston and metering rod together with the spring from the primary jet and main body. If necessary flick the assembly up and down to dislodge the power piston plastic retainer.
- (4) Remove the plastic block and then withdraw the float, needle valve and fulcrum pin from the float chamber as an assembly.
- (5) Slowly invert the main body to drain any remaining fuel from the float chamber.
- (6) Using a correct fitting screwdriver, unscrew and remove the main jet from the float chamber.
- (7) Remove the needle valve seat and sealing ring from the float chamber.
- (8) Clean all parts in petrol or cleaning solvent and blow dry with compressed air. Blow out all jets and passages with compressed air in the normal direction of flow.
- (9) Check the operation of the anti dieseling solenoid as follows:

Connect the positive terminal of a 12 volt battery to the solenoid electrical connection. Connect the negative terminal of the battery to the body of the solenoid. When the circuit is completed, the plunger should move into the body of the solenoid. Renew the solenoid as necessary.

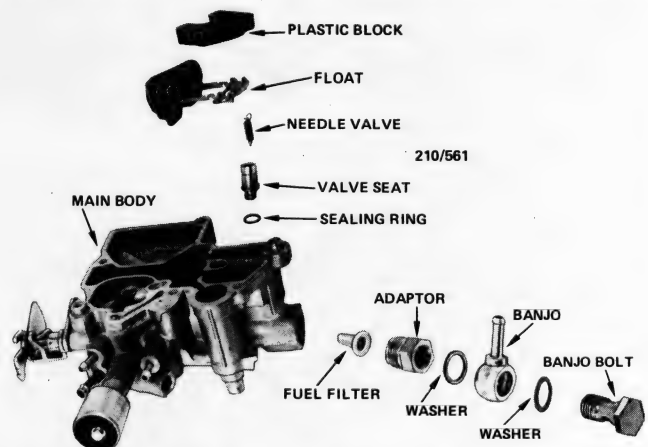
- (10) Visually inspect all parts for serviceability, paying particular attention to the metering rod and the accelerator pump plunger. Renew any suspect parts.



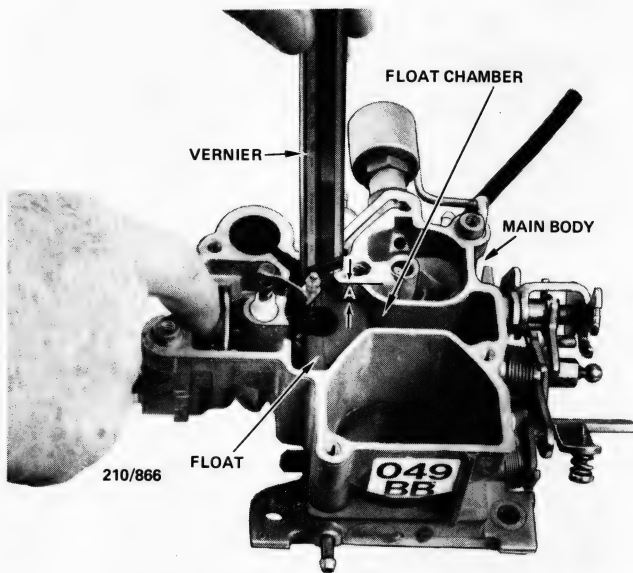
Primary jet and metering rod removed from main body.

Assembly of the main body is a reversal of the dismantling procedure with attention to the following:

Set the float level before installing a new top cover gasket and the accelerator pump plunger. With the main body in the normal position hold down the fulcrum pin and lift the float until the needle valve is lightly seated in the needle seat. Hold the float in this position and measure the distance from the top of the float chamber to the top of the float. This distance must be 8 mm. If necessary bend the float arm to obtain the correct float level setting.



Float components, fuel filter and fuel inlet components removed from main body.

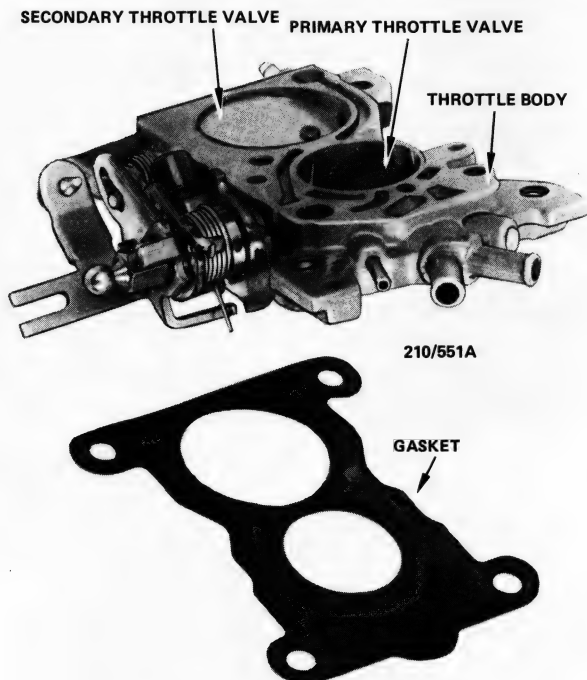


To check float level lightly seat needle valve and measure from top of float chamber to top of float. Distance A = 8 mm. To adjust float level bend float arm.

TO SERVICE THROTTLE BODY

Due to the close tolerances used by the manufacturer it would be impossible to reproduce the fit of the throttle valve shafts in the throttle body. For this reason if any damage or wear is apparent in the throttle valves or shafts the complete throttle body should be renewed.

Servicing of the throttle body consists of cleaning the body in a suitable solvent and blowing dry with compressed air. The mixture screw must not be removed or adjust-



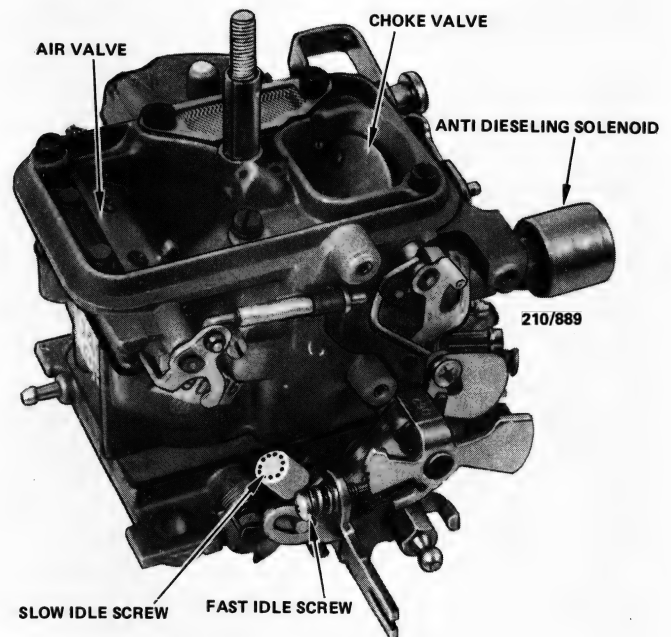
View of throttle body.

ed as this will disturb the idle mixture. The external levers and linkage should be checked for ease of movement and any sticking of the linkage should be rectified.

TO ASSEMBLE

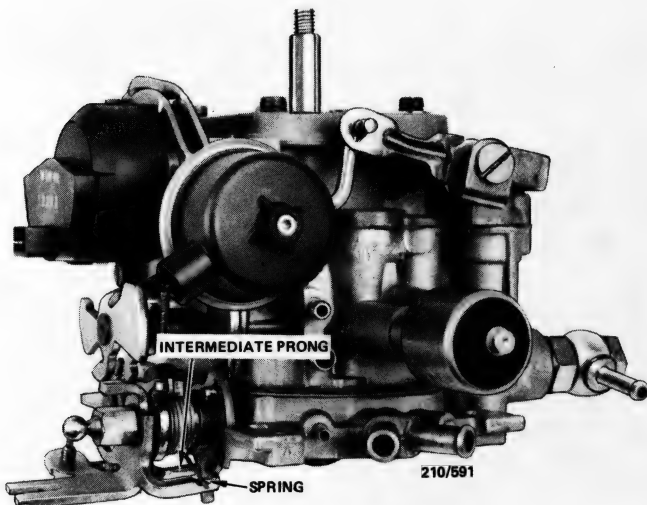
Assembly is a reversal of the dismantling procedure with attention to the following points:

- (1) Carefully instal the top cover and tighten the retaining screws. Ensure the long and short screws are fitted to their correct positions. Check the accelerator pump plunger for free operation.
- (2) Using a new gasket fit the throttle body to the main body and securely tighten the retaining screws.
- (3) Connect the link on the fast idle cam to the choke valve lever and secure with the retaining clip.



View of carburettor with choke and vacuum break assembly removed.

- (4) Connect the accelerator pump rod and secure with the split pin where applicable.
- (5) Place the vacuum break unit onto the top cover mounting lugs.
- (6) Instal the choke cover and the retaining ring ensuring that the bi-metal spring engages with the choke valve lever.
Turn the choke cover until the pointer on the cover is aligned one notch away from the centre division mark towards the lean (L) side on the vacuum break unit bracket, then tighten the retaining ring securing screws.
- (7) Carry out the initial adjustments as outlined under the following heading, then instal the carburettor to the engine.
- (8) Start and run the engine until it reaches normal operating temperature and finally adjust the slow and fast idle speeds as described in the Engine Tune-up section.



View of carburettor showing location of wide open throttle checking and adjusting points.

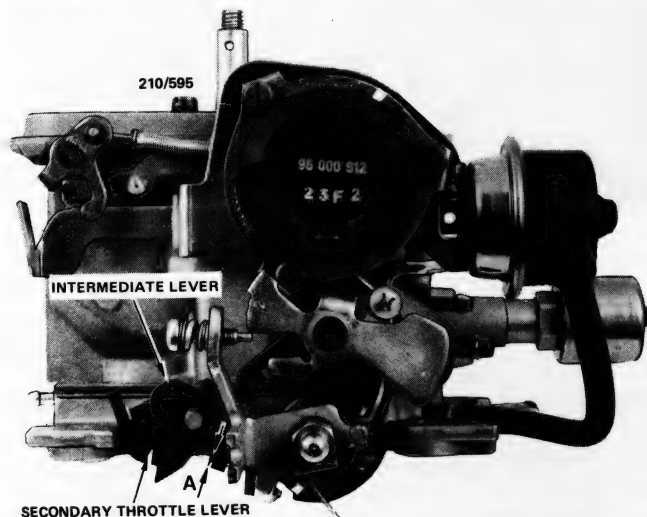
ADJUSTMENTS - CARBURETTOR REMOVED FROM ENGINE

To Check and Adjust Wide Open Throttle

- (1) Open the choke valve and secure the valve in the open position.
- (2) Fully open the primary and secondary throttle valves and hold them in the open position.
- (3) Measure the distance between the prong on the intermediate lever and the spring hooked over the primary throttle lever. The distance should be 0.5 mm.
- (4) If adjustment is necessary bend the prong on the intermediate lever.

To Check and Adjust Secondary Throttle Opening

- (1) Open the primary throttle valve and secure the valve in the open position.



Method of checking secondary throttle opening.
Distance A = 0.3 mm.

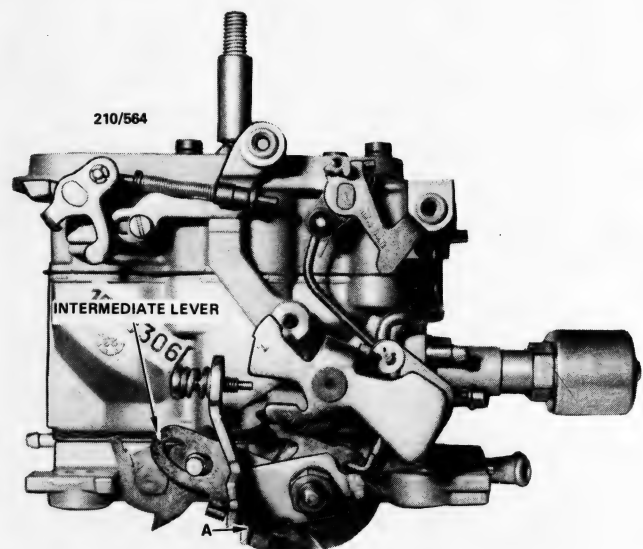
- (2) Hold the secondary throttle valve in the closed position and push the intermediate lever to the closed position.

- (3) Check the clearance between the prong on the secondary throttle lever and the intermediate lever. The clearance should be 0.3 mm.

- (4) If adjustment is necessary, bend the prong on the secondary throttle lever.

To Check and Adjust Secondary Throttle Closing Setting

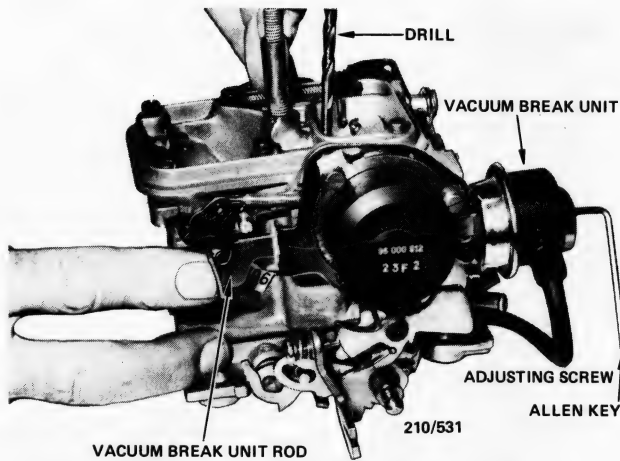
- (1) Open the choke valve and secure the valve in the open position.
- (2) Ensure that the idle stop lever rests on the slow idle stop screw and that the secondary throttle valve is closed.
- (3) Gently push on the secondary throttle valve to the open and then back to the closed position. The movement of the secondary throttle valve should be 0.4 mm in this test.
- (4) If adjustment is necessary, bend the prong on the intermediate lever.



To adjust secondary throttle closing setting bend prong A on the intermediate lever.

To Check and Adjust Vacuum Break Setting

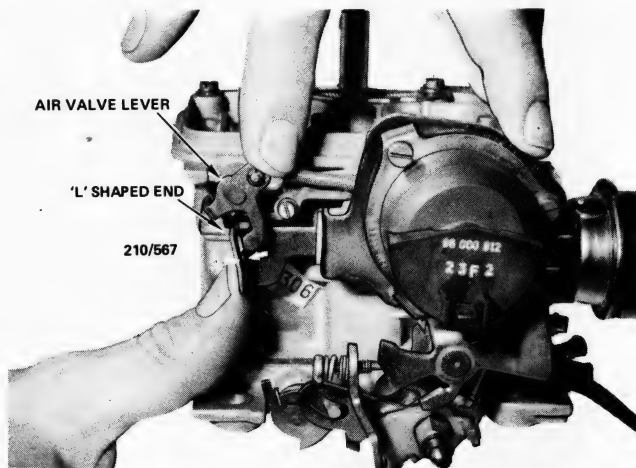
- (1) Open the primary throttle valve, then close the choke valve. Release the primary throttle valve.
- (2) Push the vacuum break unit rod into the vacuum break unit and hold the rod in this position.
- (3) Measure the gap between the choke valve and the top cover wall. The gap should be 5 mm.
- (4) If adjustment is necessary, turn the adjustment screw at the rear of the vacuum break unit.
- (5) Lock the adjusting screw on the vacuum break unit with a daub of paint.



Method of checking vacuum break setting.

To Check and Adjust Air Valve Dash Pot Clearance

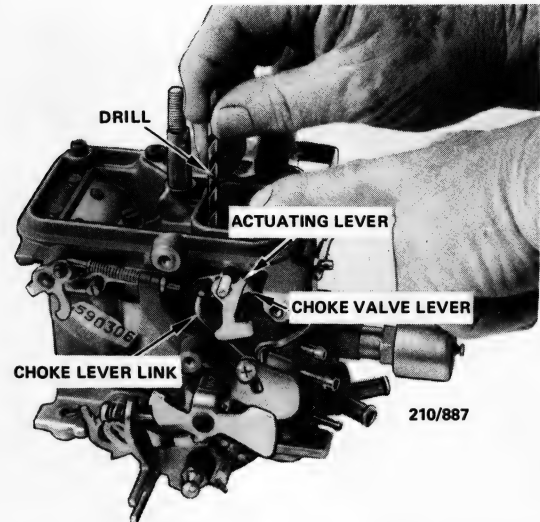
- (1) With the air valve held in the closed position push the vacuum break unit rod into the vacuum break unit.
- (2) Measure the gap between the "L" shaped end of the vacuum break unit and the lever on the air valve. The gap should be 0.2 mm.
- (3) If adjustment is necessary, bend the "L" shaped end of the vacuum break unit rod.



Method of checking air valve dash pot clearance.
Distance A = 0.2 mm.

To Check and Adjust Second Step Setting

- (1) Open the primary throttle valve and at the same time close the choke valve until the fast idle adjusting screw can be rested on the second step of the fast idle cam.
- (2) With the fast idle screw resting on the second step of the fast idle cam close the choke valve completely.
- (3) Hold the choke valve actuating lever in the closed position and gently open the choke valve until the



Checking second step setting. To adjust bend choke lever link.

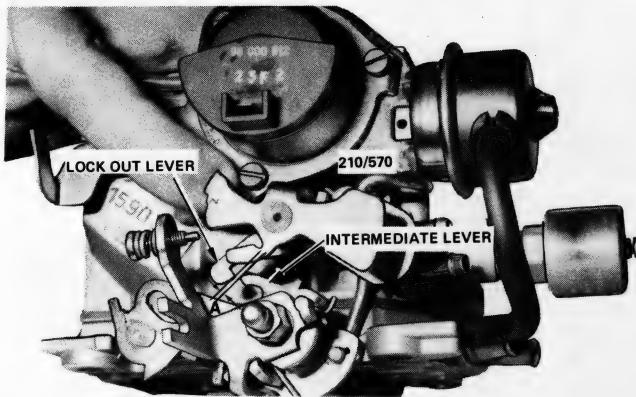
- lug on the choke valve lever touches the prong on the actuating lever.
- (4) Measure the gap between the choke valve and the top cover wall. The gap should be 4.5 mm.
- (5) If adjustment is necessary remove the choke cover and vacuum break unit. Bend the link between the choke valve lever and the fast idle cam as required.

To Check and Adjust Wide Open Kick Setting

- (1) Hold the choke valve in the closed position and fully open the primary throttle valve. Secure the primary throttle valve in the open position.
- (2) Hold the choke valve actuating lever in the closed position and gently open the choke valve until the lug on the choke valve touches the prong on the actuating lever.
- (3) Measure the gap between the choke valve and the top cover wall. The gap should be 7.5 mm.
- (4) If adjustment is necessary bend the lug on the fast idle cam.

To Check and Adjust Secondary Lock Out Mechanism

- (1) Hold the choke valve in the closed position and fully open the primary throttle valve. Check that the intermediate lever and the secondary lock out lever are engaged.
- (2) With the primary throttle valve fully open and the intermediate and secondary lock out levers engaged check the possible movement of the secondary throttle valve. The movement in the throttle valve should be 0.4 mm.
- (3) If adjustment is necessary bend the engaging prong on the intermediate lever.
- (4) With the primary valve fully open move the choke valve to the open position. Hold the choke valve open and close the primary throttle valve.



Checking secondary lock out mechanism with choke valve fully open. Gap A = 2 mm.

(5) Check that there is a gap of 2 mm between the secondary lock out lever and the intermediate lever. If the gap is not satisfactory, check operations (1), (2) and (3).

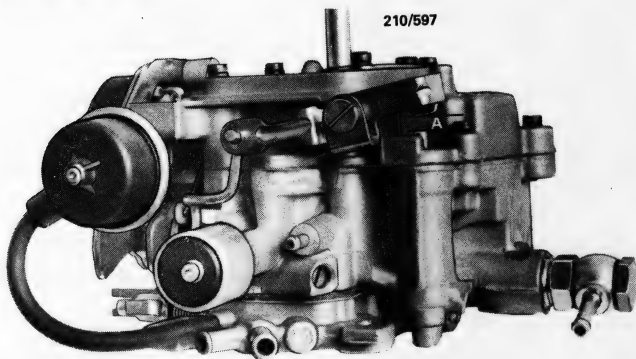
To Check and Adjust Accelerator Pump Setting

(1) Place the throttle valve in the closed position and the choke valve in the fully open position.

(2) Without disturbing the accelerator pump lever, slowly push the accelerator pump plunger downward until resistance on the secondary plunger spring is felt.

(3) At that point the gap between the accelerator pump lever tab and the plunger should be 8 mm.

(4) If adjustment is necessary bend the accelerator pump lever tab.



Checking accelerator pump setting. Distance 'A' = 8 mm.

ADJUSTMENTS - CARBURETTOR INSTALLED TO ENGINE

To Check, Renew and Adjust Automatic Choke Cover

NOTE: To check the operation of the automatic choke, the engine must be cold and the ambient temperature 22 deg. C or less. Ensure that the pointer on the choke cover is aligned one notch away from the centre division mark towards the lean (L) side on the vacuum break unit bracket.

(1) Open the engine bonnet and remove the air cleaner assembly.

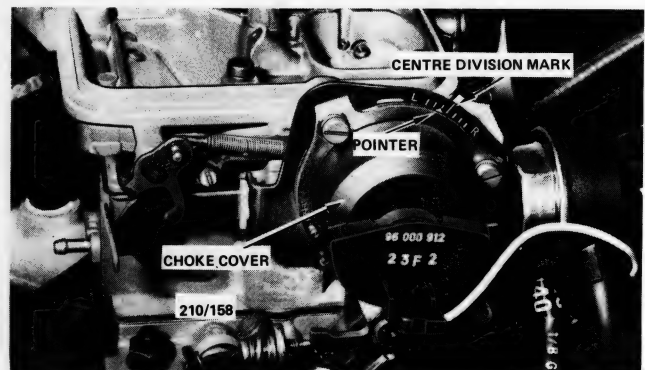
(2) Lightly open the primary throttle valve and check that the choke valve is closed.

(3) Switch the ignition on, do not run the engine.

(4) Lightly open the primary throttle valve and observe the choke valve. As the primary throttle valve is opened, the choke valve should move to the fully open position.

If the choke valve fails to open after more than three minutes, renew and adjust the choke cover as follows:

(a) Disconnect the electrical wire from the choke cover and remove the three screws securing the choke cover and retaining ring to the carburettor top cover.



Automatic choke cover setting.

(b) Withdraw the choke cover taking care not to dislodge the vacuum break unit and lift the retaining ring from the choke cover.

(c) Loosely instal a new choke cover ensuring that the eye in the bi-metal spring engages in the choke valve actuating lever.

(d) Fit the retaining ring and the securing screws loosely.

(e) Turn the choke cover until the pointer on the cover is aligned one notch away from the centre division mark towards the lean (L) side on the vacuum break unit bracket, then tighten the retaining ring securing screws.

(f) Connect the electrical wire to the choke cover.

(5) When satisfied that the automatic choke works correctly, instal the air cleaner assembly.

To Adjust Slow and Fast Idle Speeds

Refer to the engine Tune-up section for the correct adjusting procedure.

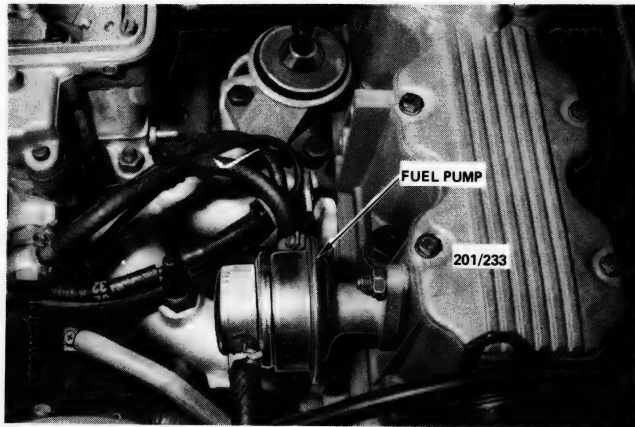
3. FUEL PUMP

Special Equipment Required:

To Test Pump Operation - Pressure gauge

DESCRIPTION

The fuel pump is a diaphragm type operated mechanically by a pushrod arrangement from an eccentric on the camshaft.



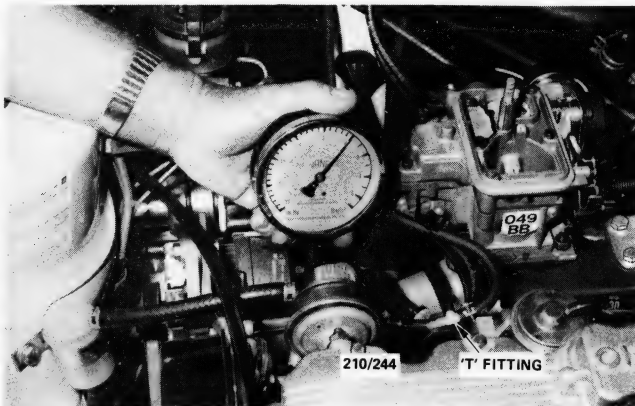
Installed view of fuel pump

Pressure in the pump outlet pipe, when the carburetor needle valve is closed, will hold the pump diaphragm outwards against the pressure of the diaphragm spring. This allows the pushrod to operate at idle until the pressure in the outlet pipe is relieved and the diaphragm moves inwards under pressure from the diaphragm spring.

Apart from the filter screen, the fuel pump is non serviceable and must be renewed as a unit when found to be defective.

TO TEST PUMP PRESSURE

- (1) Disconnect the fuel hose from the fuel pump.
- (2) Instal a 'T' fitting and a calibrated pressure gauge between the fuel hose and the fuel pump.



Checking the fuel pump operating pressure with the aid of a 'T' fitting and pressure gauge.

- (3) Start the engine and run it at approximately 1000 rpm and note the pressure reading.
- (4) The pump operation is satisfactory if the pressure reading is between 22 – 26 kPa.
- (5) Remove the 'T' piece fitting from the fuel hose and connect the fuel hose to the fuel pump

TO REMOVE AND INSTAL

- (1) Disconnect the battery negative terminal.
- (2) Disconnect the fuel hoses from the fuel pump.

- (3) Remove the two nuts securing the fuel pump to the camshaft housing and withdraw the fuel pump from the engine.

NOTE: Loosen the fuel pump retaining nuts progressively until the pressure of the diaphragm spring is relieved.

Installation is a reversal of the removal procedure with attention to the following points:

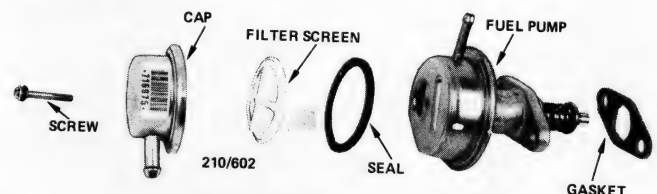
- (1) Use a new insulator between the fuel pump and the camshaft housing. if necessary carefully scrape the gasket surfaces clean, making sure that no foreign matter is dropped into the camshaft housing or the fuel pump.
- (2) Tighten the fuel pump retaining nuts progressively.

TO REMOVE AND INSTAL FUEL PUMP FILTER SCREEN

- (1) Disconnect the fuel pump inlet hose from the fuel pump cap.
- (2) Remove the screw retaining the fuel pump cap the fuel pump body.
- (3) Withdraw the cap, the seal and the filter screen from the fuel pump body.
- (4) Check the condition of the filter screen. The filter screen may be cleaned and used again. Renew the filter screen if damaged.

Installation is a reversal of the removal procedure with attention to the following points:

- (1) Clean the fuel pump chamber of any foreign material.
- (2) Use a new fuel pump cap seal, do not use any sealing compound.



Dismantled view of fuel pump.

4. FUEL FILTER

The fuel filter is an inline paper element type and is installed between the fuel tank and the fuel pump in the fuel delivery line. It is situated in the engine compartment and should be periodically renewed as described in the Engine Tune-up section.

5. AIR CLEANER

TO REMOVE AND DISMANTLE

- (1) Open the engine bonnet and fit fender covers to both front fenders.



Dismantled view of air cleaner.

NOTE: To prevent dirt falling into the top of the carburettor, do not remove the element while the air cleaner body is mounted on the carburettor.

- (2) Disconnect the thermostatic valve vacuum hose from the carburettor.
- (3) Disconnect the engine ventilation hose and the pulsair system inlet hose from the air cleaner body.
- (4) Remove the nut and the washer retaining the air cleaner assembly to the carburettor.
- (5) Lift the air cleaner assembly off the carburettor at the same time disengaging the air cleaner assembly spout from the hot air stove. Remove the air cleaner assembly from the engine.
- (6) Unclip the top cover retaining clips and withdraw the top cover from the air cleaner body.
- (7) Remove the air cleaner element from the air cleaner body.
- (8) Discard the element as necessary and clean off the accumulation of dirt or dust on the main body and top cover of the air cleaner.

TO ASSEMBLE AND INSTALL

- (1) Ensure that the carburettor to air cleaner body gasket is correctly installed to the carburettor.
- (2) Place the air cleaner element onto the air

cleaner body. Install the top cover and secure the top cover with the retaining clips.

(3) Place the air cleaner assembly onto the carburettor at the same time engaging the hot air stove connector on the air cleaner spout with the hot air stove.

(4) Connect the thermostatic valve vacuum hose to the carburettor.

(5) Connect the engine ventilation hose and the pulsair system inlet hose to the air cleaner assembly.

(6) Install the washer and the nut retaining the air cleaner assembly to the carburettor.

6. THROTTLE CABLE

TO REMOVE AND INSTALL

(1) Raise the engine bonnet and place fender covers on both front fenders.

(2) Disconnect the throttle inner cable from the carburettor throttle linkage by springing off the clip.

(3) Remove the locknut from the outer cable at the mounting bracket and lift the cable out through the slot in the mounting bracket.

(4) Disconnect the strap retaining the cable assembly to the camshaft housing.

(5) Working inside the vehicle, remove the screws retaining the trim panel under the steering column and remove the trim panel.

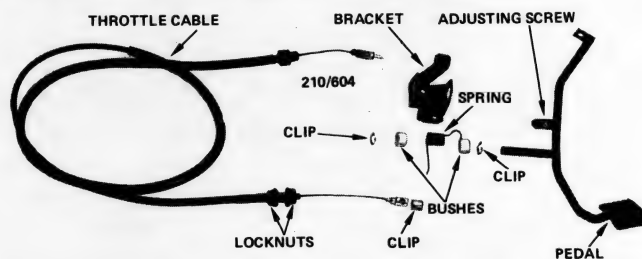
(6) Unclip the throttle inner cable and the retaining clip from the top end of the accelerator pedal.

(7) Working beneath the right hand side front wheel arch unscrew the throttle outer cable from the body panel and remove the throttle cable assembly from the vehicle.

NOTE: The right hand side front road wheel may have to be removed to gain access to the throttle outer cable retaining nut.

Installation is a reversal of the removal procedure with attention to the following points:

- (1) Lubricate both ends of the inner cable with a small amount of grease.
- (2) Ensure that the outer cable retaining nut is free from dirt when installing the nut to the body panel.
- (3) Ensure that the throttle cable is installed in a smooth curve without kinks or twist and does not interfere with any engine components.



Dismantled view of throttle cable and associated components.

(4) Check and if necessary adjust the throttle cable as outlined under the next heading.

TO ADJUST THROTTLE CABLE

(1) Loosen the locknuts on the throttle outer cable at the mounting bracket on the inlet manifold.

(2) Loosen and almost remove the retaining nuts on the idle load compensator and move the idle load compensator away from the throttle stop pad.

(3) Fully depress the accelerator pedal and retain in that position.

(4) Adjust the outer cable at the mounting bracket to a position where both the primary and the secondary throttle valves are fully open.

(5) Tighten the locknuts and release the accelerator pedal.

(6) Working inside the vehicle, check and if necessary remove any slack from the inner cable, or free play from the accelerator pedal by turning the adjusting screw so that the inner cable is slightly tensioned. The adjusting screw is located directly above the accelerator pedal pivot.

(7) Tighten the idle load compensator retaining nuts. Check and if necessary adjust the idle speed as described in the Engine Tune-up section.

7. FUEL TANK

TO REMOVE AND INSTAL

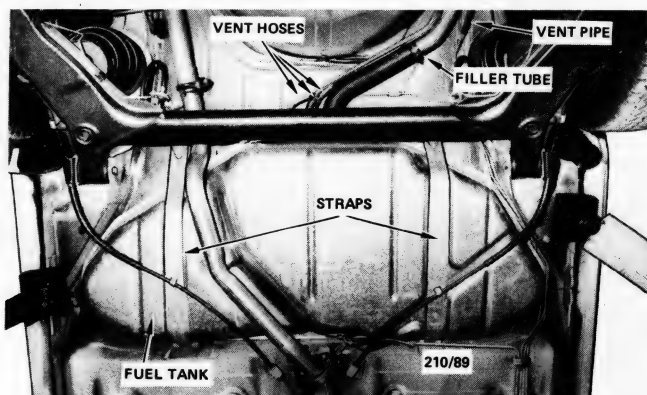
(1) Raise the rear of the vehicle and support on chassis stands. Refer to the Wheels and Tyres section under the heading Jacking Information for the correct procedure.

(2) Disconnect the negative battery terminal.

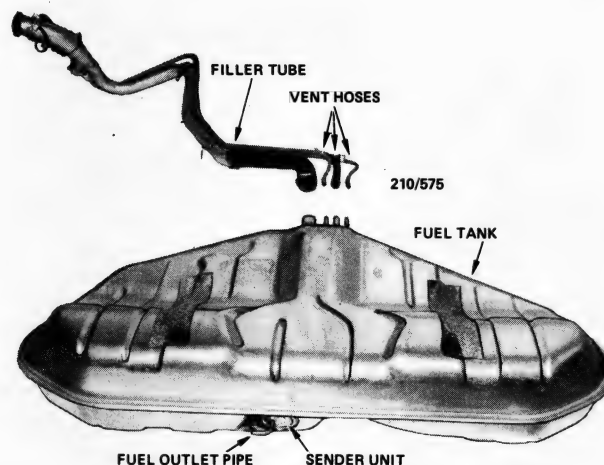
(3) Remove the front exhaust muffler and the intermediate pipe from the vehicle as described in the Engine section under the heading Exhaust System.

(4) Remove the lock and adjusting nuts from the handbrake cable relay rod and withdraw the handbrake cable and the equaliser from the relay rod.

(5) Move the handbrake outer cable rearward out of the retaining brackets and the inner cable away from between the brackets and the floor.



Installed view of fuel tank



View of fuel tank and filler tube assembly.

(6) Open up the clips retaining the handbrake cable to the fuel tank and remove the handbrake cable from the tank.

(7) Remove the stone guard retaining screws from inside the right hand side rear wheel arch.

(8) Remove the bolt retaining the filler tube support bracket and the stone guard. Withdraw the stone guard from the vehicle.

(9) Disconnect the vent pipe leading to the charcoal canister at the hose connection.

(10) Mark or note the installed position of the three vent hoses at the rear of the fuel tank and disconnect the hoses from the fuel tank. Suitably plug all hoses and fuel tank connections.

(11) Disconnect the filler tube hose from the fuel tank.

(12) If the filler tube and the vent hoses are to be removed from the vehicle, gently pull the assembly down and out of the upper rubber grommet in the body panel.

(13) Drain the fuel from the fuel tank by syphoning through the filler tube connection at the fuel tank.

(14) Disconnect the wire connector from the fuel tank sender unit.

(15) Disconnect the fuel supply pipe connecting hose from the fuel tank sender unit, plug the hose and carefully pull the fuel supply pipe downwards.

(16) Remove the nuts and washers retaining the fuel tank support straps to the vehicle body and lower the fuel tank to the floor.

Installation is a reversal of the removal procedure with attention to the following points:

(1) When installing the filler tube through the rubber grommet in the body panel ensure that the grommet is properly seated around the filler tube.

NOTE: Using a soap and water solution as a lubricant will make this operation easier.

(2) Check all connections and vent hoses for security and leaks.

(3) Coat the threads of the stone guard retaining screws with non hardening sealer before fitting the stone guard.

SPECIFICATIONS

Type	Single dry plate with diaphragm pressure spring
Clutch operation	Mechanical, cable type
Pressure plate spring	Diaphragm type
Driven plate hub	Damper spring
Release bearing	Ball thrust type, prelubricated and sealed
Spigot bearing	Caged needle rollers
Clutch pedal height	242 - 246 mm
Release lever free play	1 - 3 mm
Flywheel machining limit	0.3 mm

TORQUE WRENCH SETTINGS

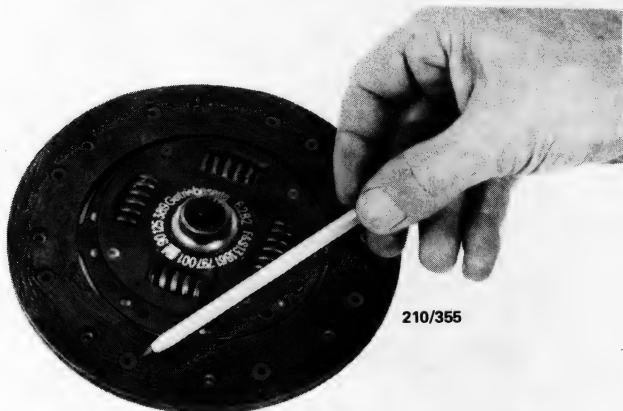
Pressure plate to flywheel bolts	18 Nm
Release bearing fork clamp bolt	40 Nm
Release bearing guide bolts	5 Nm
Flywheel to crankshaft bolts	60 Nm
Filister head screw	18 Nm
Screw cap	50 Nm

1. CLUTCH TROUBLE SHOOTING

CLUTCH SLIPPING

- (1) Worn driven plate facings: Check and renew clutch driven plate.
- (2) Weak or broken pressure plate diaphragm spring: Check and renew pressure plate assembly.
- (3) Worn or scored pressure plate face: Check and renew pressure plate assembly.
- (4) Worn or scored flywheel face: Check and machine or renew flywheel and ring gear.
- (5) Insufficient release lever free play: Check and adjust release lever free play to Specifications.

NOTE: In most cases clutch slippage is first evident by a marked increase in engine revs, for no apparent reason, when pulling up a steep hill. The clutch condition can be posi-

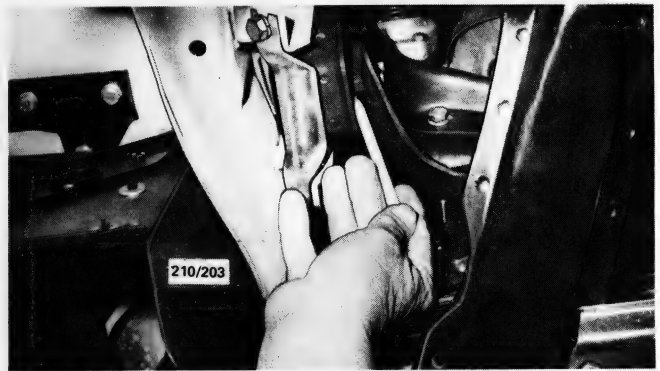


Check the clutch driven plate for wear, glazing or oil saturation.

tively diagnosed as follows: With the hand-brake firmly applied and with the road wheels chocked, place the transmission in top gear and with the engine revving at approximately 1500 rpm, slowly release the clutch. Clutch slipping is evident if the engine does not stall. Make the test as quick as possible to prevent any further clutch damage.

CLUTCH SHUDDER

- (1) Oil on driven plate facings: Check and renew clutch driven plate. Check and rectify oil leak.
- (2) Loose or damaged driven plate hub: Check and renew clutch driven plate.
- (3) Loose driven plate facings: Renew driven plate.
- (4) Cracked pressure plate face: Renew pressure plate assembly.
- (5) Scored flywheel face: Machine or renew flywheel.
- (6) Loose or deteriorated engine mountings: Check and renew engine mountings as necessary.

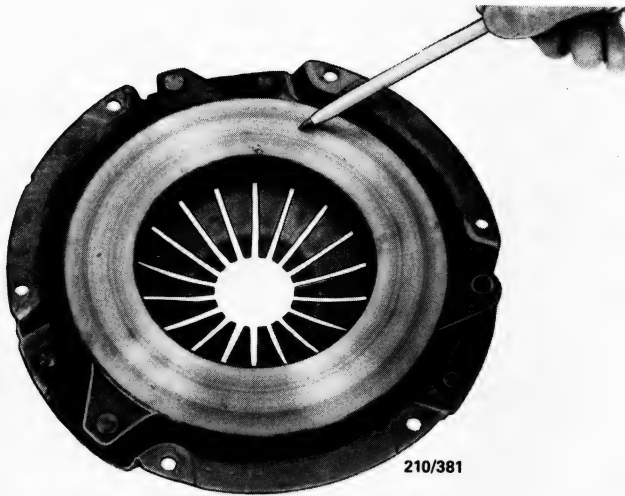


Check the engine mountings for damage or looseness as they can also cause clutch shudder.

NOTE: Clutch shudder is usually most evident when reversing up an incline. As loose or damaged engine mountings are a cause for clutch shudder, thoroughly check the engine mounting rubbers and mounting hardware for damage or looseness before removing the clutch for inspection.

CLUTCH GRAB

- (1) Gummy driven plate facings: Renew clutch driven plate.
- (2) Cracked pressure plate face: Renew clutch pressure plate assembly.
- (3) Driven plate damper springs broken or weak: Renew driven plate.
- (4) Loose or broken engine mountings: Check and renew engine mountings as necessary.
- (5) Clutch cable sticking, worn or damaged: Check and renew clutch cable as necessary.



Check the clutch pressure plate for high spots, glazing, cracking or scoring.

NOTE: Visually check out the external operation of the release lever before removing the clutch for inspection.

CLUTCH PEDAL HARD TO OPERATE

- (1) Clutch pedal pivot seized: Check and free-up clutch pedal pivot.
- (2) Clutch cable binding: Renew clutch cable.
- (3) Worn clutch driven plate: Check and renew clutch driven plate.
- (4) Clutch release fork shaft binding: Check and free-up fork shaft. Renew release fork shaft bushes as necessary.

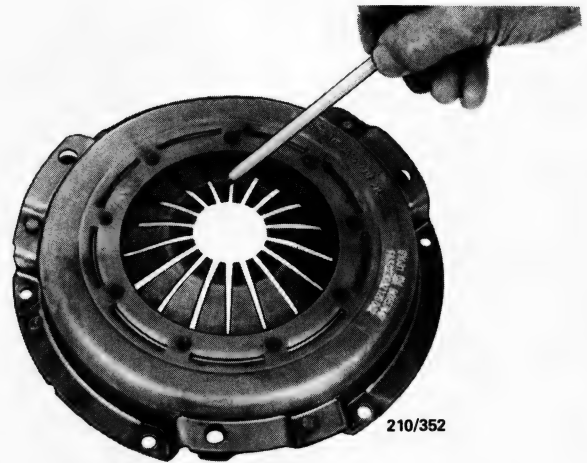
INSUFFICIENT CLUTCH RELEASE

- (1) Clutch driven plate warped: Renew driven plate.
- (2) Clutch cable frayed or broken: Check and renew clutch cable.
- (3) Incorrect clutch pedal height: Check and adjust pedal height.
- (4) Excessive clutch release lever free play: Check and adjust free play to Specifications.
- (5) Worn or damaged release mechanism: Check and renew components as necessary.
- (6) Clutch driven plate hub binding on clutch shaft splines: Free-up clutch plate or renew as necessary.

NOTE: Visually check that the clutch cable operates the clutch release lever before removing the clutch assembly for inspection.

CLUTCH RELEASE BEARING NOISE

- (1) Dry or seized bearing: Check and renew bearing.
- (2) Weak or broken diaphragm spring: Renew pressure plate assembly.



Check the clutch pressure plate diaphragm fingers for scoring or other damage.

- (3) Excessive clutch pedal travel: Check and adjust pedal height to Specifications.

NOTE: Lightly depress the clutch pedal with the engine running to check for release bearing noise. If the release bearing is faulty and has to be renewed always check out the other clutch components.

2. DESCRIPTION

The clutch consists of a single dry driven plate assembly splined to slide on the transaxle clutch shaft and a diaphragm spring type pressure plate assembly which is bolted to the engine flywheel.

The driven plate is positioned between the pressure plate and flywheel and this transmits the drive from the engine to the transmission.

Damper springs are interposed between the hub of the driven plate assembly and the plate friction surfaces in order to cushion the drive.

The release mechanism is actuated by the clutch pedal via a cable to the release lever and bearing, which is of the self aligning constant mesh type, then to the fingers of the pressure plate diaphragm spring assembly.

Operation of the clutch pedal moves the release bearing and diaphragm centre towards the flywheel. When the outer edge of the diaphragm deflects the clutch is caused to disengage.

3. CLUTCH UNIT AND RELEASE MECHANISM

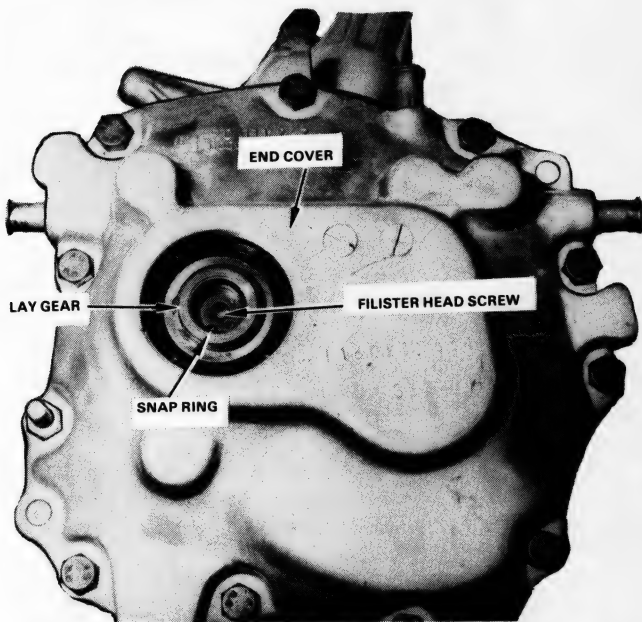
Special Equipment Required:

To Remove—Clutch shaft extractor and slide hammer, three pressure plate retaining clips, filister head screw tool, 36 mm socket

To instal—Three pressure plate retaining clips, filister head screw tool, 36 mm socket

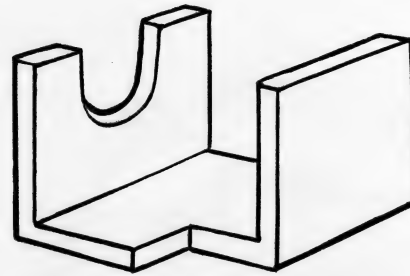
TO REMOVE AND DISMANTLE

- (1) Loosen the left hand side front road wheel retaining bolts and mark the relationship between the road wheel and the wheel hub.
- (2) Raise the front of the vehicle and support on chassis stands placed under the correct support points as described in the Wheels and Tyres section.
- (3) Remove the left hand side front road wheel.
- (4) Using a 36 mm socket remove the screw cap from the transaxle end cover.
- (5) Remove the snap ring from the inside of the laygear bore in front of the clutch shaft.
- (6) Using the filister head screw tool, remove the filister head screw from the clutch shaft.



View of transaxle end cover showing snap ring and filister head screw at rear of clutch shaft. End cover screw cap removed.

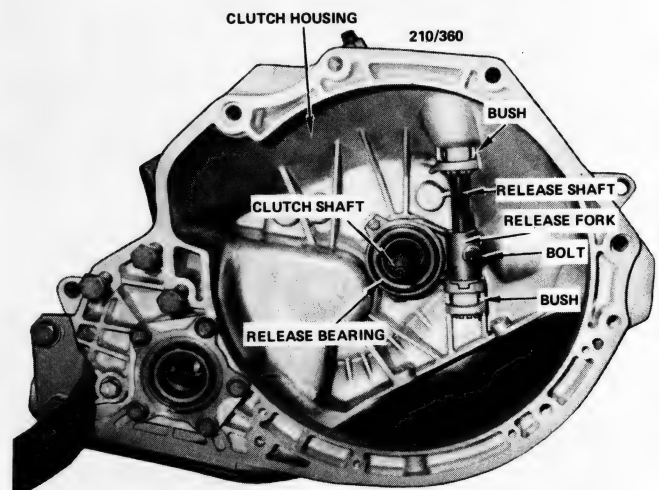
- (7) Instal the clutch shaft extractor to the clutch shaft and the slide hammer to the extractor making sure that the threaded ends of both tools are screwed in the full length of the thread.
- (8) Using the slide hammer withdraw the clutch shaft rearwards until the clutch shaft has come to a full stop. Remove the slide hammer and the extractor from the clutch shaft.
- (9) Remove the bolts retaining the front cross-brace to the front suspension control arm carriers and remove the crossbrace.
- (10) Remove the bolts that retain the clutch cover to the clutch housing and withdraw the clutch cover.
- (11) Have a second operator fully depress the clutch pedal.
- (12) With the clutch pedal fully depressed and the clutch pressure plate disengaged instal the three pressure plate retaining clips to the pressure plate at 120 deg intervals. Release the clutch pedal.



210/LD10

Illustration showing one of three identical pressure plate retaining clips needed to remove and instal the clutch unit.

- (13) Remove the clutch cable retaining clip from the clutch cable at the clutch release lever, loosen the clutch cable adjusting nut and disconnect the clutch cable from the release lever.
- (14) Remove the pressure plate assembly retaining bolts. Slacken the bolts progressively and diagonally to prevent distortion.
- (15) Withdraw the clutch driven plate and the pressure plate assembly from the flywheel and remove the assembly from the clutch housing.
- (16) Remove the bolt retaining the clutch release fork to the clutch release lever shaft.
- (17) Withdraw the clutch release bearing and carrier assembly from the clutch housing.
- (18) Pull the clutch release shaft and lever assembly up through the clutch housing and remove the assembly from the clutch housing and at the same time remove the clutch release fork from the clutch release shaft.
- (19) Remove the bolts retaining the clutch release bearing guide to the transmission case and withdraw the guide and the 'O' ring from the transmission case.



View of clutch release mechanism installed to the clutch housing.



Dismantled view of clutch release mechanism components.

TO CHECK AND INSPECT

(1) Check the driven plate facings. If the driven plate facings are worn, highly glazed or gummy with oil, renew the driven plate as an assembly. If the driven plate is still serviceable, do not allow any cleaning fluid or grease to contaminate the plate facings.

NOTE: Should there be traces of oil on the facings the source has to be investigated and rectified.

(2) Check the hub of the driven plate for looseness and the damper springs for wear or breakage.

(3) Check the pressure plate assembly for wear on the diaphragm spring fingers, cracked diaphragm spring and a distorted cover. Check that the pressure plate is not badly scored.

(4) Inspect the flywheel face for heat cracks, burn marks or scoring. Should the flywheel be excessively scored or cracked it will have to be machined or renewed. Light scoring may be removed by rubbing over the flywheel face with emery cloth.

(5) Check the clutch shaft spigot bearing in the

rear of the crankshaft for serviceability. Only if the spigot bearing is to be renewed, remove the spigot bearing from the crankshaft using a suitable puller. Using a piece of tubing the same size as the spigot bearing outer race install the new bearing by gently tapping it into the crankshaft. Lubricate the bearing with a small amount of lithium based grease.

NOTE: Do not apply too much grease to the spigot bearing as this will act as a damper and will prevent the clutch shaft from fully entering the spigot bearing.

(6) Check the clutch release lever and shaft assembly for wear.

(7) Check the clutch release shaft bushes for wear and security.

(8) Check the clutch release bearing for noise and roughness.

(9) Renew all components which upon inspection prove to be unserviceable.

NOTE: When cleaning clutch parts, do not immerse the release bearing in cleaning fluid. This bearing is lubricated during assembly and requires no further lubrication in service.

TO ASSEMBLE AND INSTALL

Assembly and installation is a reversal of the removal procedure with attention to the following points:

(1) Tap the oil seal out of the release bearing guide, coat the outside edge of a new seal with a suitable sealing compound and install the new seal into the bearing guide ensuring that the lip cavity of the new seal is facing towards the transaxle case.

(2) Install a new bearing guide 'O' ring without sealing compound or grease to the transaxle case groove and install the bearing guide and the retaining bolts to the transaxle case. Tighten the bolts to Specifications.

(3) Coat the release bearing guide sliding surface lightly with a molybdenum disulphide grease.

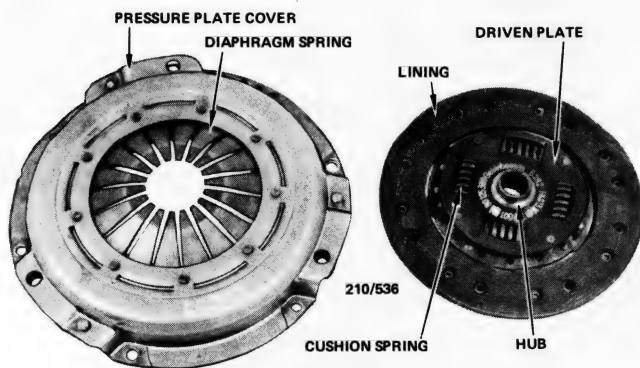
(4) Install the clutch release shaft and lever assembly to the clutch housing, push the assembly halfway down then install the clutch release fork to the shaft. Fully push the shaft down to its correct position.

(5) Install the release bearing and carrier assembly to the clutch release fork.

(6) Install the clutch fork retaining bolt ensuring that the retaining bolt enters its locating groove in the release shaft correctly. Tighten the retaining bolt to Specifications.

(7) If a new pressure plate assembly is to be fitted, the pressure plate retaining clips on the old pressure plate assembly need to be transferred onto the new pressure plate assembly. Proceed as follows:

(a) Using a press and press plates, place the old pressure plate in the press and press down on the diaphragm fingers far enough to withdraw the retaining



Dismantled view of clutch pressure plate assembly and driven plate.

clips from the pressure plate. Remove the assembly from the press.

(b) Position the new pressure plate assembly in the press and with the diaphragm fingers protected with a small block of wood press down on the diaphragm fingers via the block of wood no more than is necessary to install the clips to retain the pressure plate in a disengaged position.

NOTE: *The forked ends of the retaining clips should be installed over the pressure plate and the plain ends over the pressure plate cover.*

(c) Release the press and remove the pressure plate assembly.

(8) Apply a small amount of molybdenum disulfide grease to the clutch driven plate hub splines.

(9) Place the clutch driven plate onto the pressure plate assembly with the raised side of the driven plate hub facing the transmission.

NOTE: *Genuine driven plates may be marked to indicate the flywheel side.*

(10) Position the clutch driven plate and the pressure plate assembly together onto the flywheel, align the notch or the 'V' mark on the pressure plate cover with the centre punch mark on the flywheel and install the pressure plate assembly retaining bolts.

(11) Progressively and diagonally, to prevent distortion, tighten the pressure plate retaining bolts to Specifications ensuring to maintain free movement of the clutch driven plate.

(12) Install the filister head screw into the rear of the clutch shaft.

(13) Push the clutch shaft forwards towards the engine, at the same time lifting the clutch driven plate and enter the clutch shaft into the clutch driven plate hub aligning the splines of the clutch driven plate with the splines on the clutch shaft.

(14) Connect the clutch cable to the clutch release lever and tighten the adjusting nut to eliminate all free play.

(15) Have an assistant slowly depress the clutch pedal just enough to be able to withdraw the pressure plate retaining clips.

NOTE: *Do not depress the clutch pedal any more than is needed as damage to the pressure plate assembly may occur through overcentering. Only after the installation has been completed and the clutch cable has been adjusted correctly may full pedal travel be used.*

(16) Tighten the filister head screw to Specifications.

(17) Using a soft faced hammer and a brass drift tap the clutch shaft fully forward until the filister head screw bottoms.

(18) Install a new snap ring into the laygear groove.

(19) Coat the threads of the screw cap with a suitable sealing compound, install the screw cap to the transaxle case end cover and tighten to Specifications.

(20) Install the cover to the clutch housing.

(21) Install the front road wheel to the wheel hub aligning the marks made prior to removal and lower the vehicle to the ground.

(22) Check the transmission oil level. Top up if necessary.

(23) Check and adjust the clutch pedal height and the clutch release lever free play as described under the heading Clutch Adjustments.

4. CLUTCH CABLE

TO REMOVE AND INSTALL

(1) Raise the engine bonnet and place fender covers on both front fenders.

(2) Using a ruler or tape, measure the length of threaded rod protruding through the clutch cable adjusting nut and note the reading.

(3) Remove the clip retaining the clutch cable to the clutch release lever.

(4) Loosen the adjusting nut on the clutch cable and disconnect the clutch cable from the clutch release lever.

(5) Disconnect the clutch cable from the retaining bracket on the transaxle and from the bracket near the starter motor.

(6) Working inside the vehicle remove the screws retaining the lower dash trim panel beneath the steering column and place the dash trim panel aside.

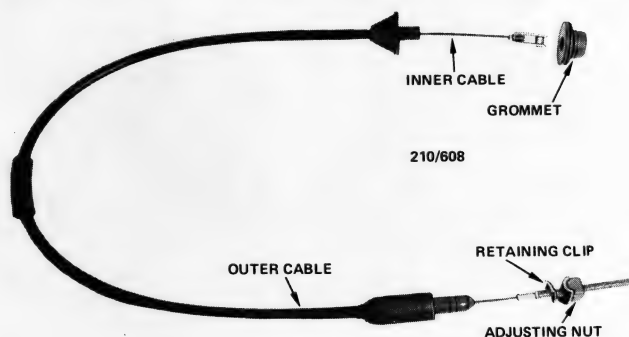
(7) Disengage the clutch pedal return spring from the clutch pedal.

(8) Disconnect the clutch inner cable clevis from the clutch pedal hook.

(9) From inside the engine compartment withdraw the clutch cable assembly through the bulkhead, noting the location of the washer and the retaining grommet on the clutch cable.

(10) Remove the clutch cable assembly from the engine compartment.

Installation is a reversal of the removal procedure with attention to the following points:



View of clutch cable assembly removed from vehicle.

- (1) Lubricate the cable clevis and the clutch release lever hook with a high melting point grease.
- (2) After connecting the clutch cable to the clutch release lever, instal and screw the adjusting nut onto the clutch cable adjusting rod the same distance as measured prior to removal.
- (3) Adjust the clutch release lever free play as described under the heading Clutch Adjustments.

NOTE: Do not depress the clutch pedal until the adjusiment has been made.

5. CLUTCH PEDAL

- (1) Raise the engine bonnet and place fender covers on both front fenders.
- (2) Disconnect the clutch inner cable from the clutch pedal and the clutch release lever as previously described.
- (3) Remove the retaining nut from the clutch pedal pivot bolt.
- (4) Slide the pivot to the left and while noting the installed position of the clutch pedal return spring withdraw the clutch pedal and the return spring from the mounting bracket.

Installation is a reversal of the removal procedure with attention to the following points:

- (1) Check the pedal pivot bushes and the pivot bolt for wear and renew as necessary.
- (2) Lubricate the pivot bushes lightly with molybdenum disulphide grease.
- (3) Reconnect the clutch cable and adjust the release lever free play as described under the heading Clutch Adjustments.



Dismantled view of clutch pedal and associated components.

6. CLUTCH ADJUSTMENTS

TO ADJUST CLUTCH PEDAL HEIGHT AND RELEASE LEVER FREE PLAY

Prior to measuring, the floor covering should be pulled back and the clutch pedal rubber pad removed.

The dimension for the pedal height is measured horizontally from the centre of the metal pedal pad to the bulkhead panel.

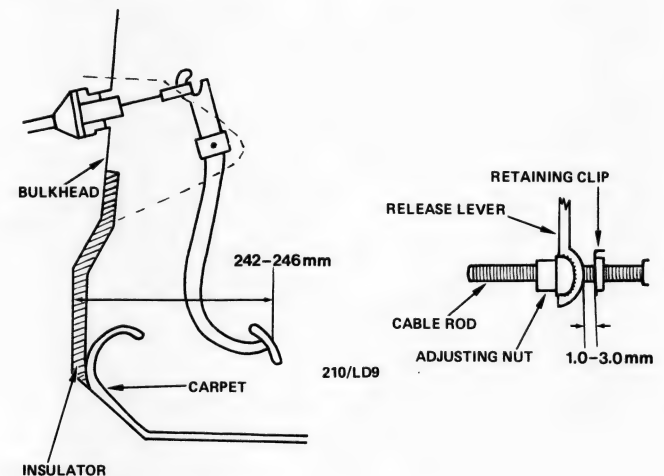
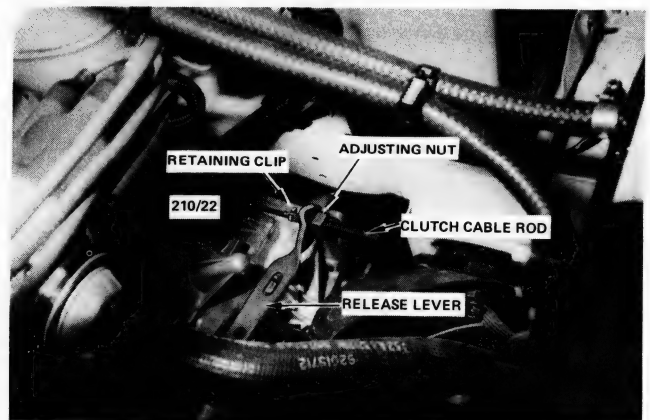


Illustration showing clutch pedal height measuring point (Left) and clutch pedal height and release lever adjusting point (Right).

- (1) Remove the clutch inner cable retaining clip at the clutch release lever.
- (2) Apply light pressure to the clutch release lever so the clutch release bearing is making contact with the clutch diaphragm spring fingers.
- (3) Turn the adjusting nut on the clutch cable in the required direction until the distance between the centre of the clutch pedal pad and the bulkhead metal panel is to Specifications.

NOTE: This distance is best measured by using a 3 mm thick welding wire not shorter



View showing clutch cable adjusting point.

than 244 mm and pointed at one end. Push the pointed end of the wire horizontally through the bulkhead insulating pad until it is touching the bulkhead panel. The other end of the wire should then be at the centre of the clutch pedal pad.

(4) With the clutch pedal height adjusted correctly, pull the clutch release lever against the clutch cable adjusting nut then instal the clutch cable retaining clip to the clutch cable to where a clearance of 1–3 mm is obtained between the clutch release lever and the retaining clip.

SPECIFICATIONS

TRANSMISSION

Type Four or five speed, synchromesh on all forward gears

Gear ratios:

Four speed -	
Fourth	0.97:1
Third	1.37:1
Second	2.16:1
First	3.55:1
Reverse	3.33:1
Five speed -	
Fifth	0.71:1
Fourth	0.89:1
Third	1.28:1
Second	1.95:1
First	3.42:1
Reverse	3.33:1

DIFFERENTIAL AND FINAL DRIVE

Type of final drive Helical ring gear and pinion
Final drive pinion Integral with transmission mainshaft

Final drive ratios:

Four speed	3.74:1
Five speed	3.94:1

* Differential carrier bearings preload:

Old bearings	1.4-2.3 kg
New bearings	3.4-5.7 kg

* See text for correct measuring method.

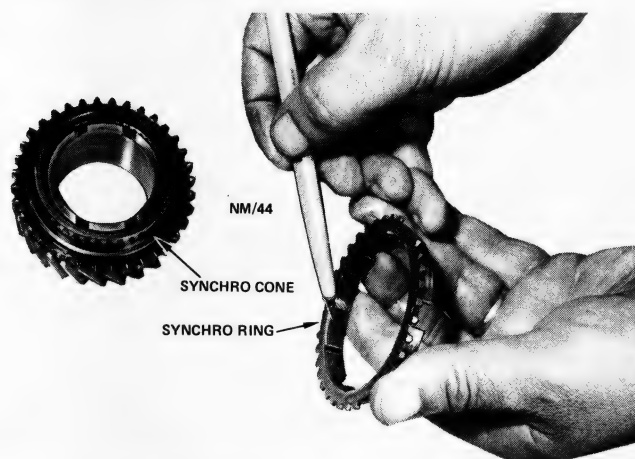
TORQUE WRENCH SETTINGS

Transaxle to engine bolts	90 Nm
Selector cover bolts	15 Nm
Differential cover bolts	35 Nm
Carrier bearing flange retaining bolts	25 Nm
Carrier bearing adjuster ring lock bolt	9 Nm
End cover to case bolts	22 Nm
End cover plug	50 Nm
Filister head screw	18 Nm
Differential pinion shaft bolt	10 Nm
Ring gear to differential case bolts	90 Nm
Interlock pin bracket	5 Nm
Fifth gear lock out assembly screws	9 Nm
Fifth gear selector fork pivot post screws	22 Nm
Oil level checking plug	10 Nm
Control rod tube to floor nuts	11 Nm
Speedometer driven gear retaining bolt	4 Nm
Reverse lamp switch	25 Nm
Torque reaction damper bracket bolts	75 Nm
Transaxle mounting bracket bolts	75 Nm

1. MANUAL TRANSAXLE AND DRIVE SHAFT TROUBLE SHOOTING

DIFFICULT GEAR CHANGE

- (1) Faulty clutch or clutch release mechanism: Check and overhaul clutch or clutch release mechanism.
- (2) Faulty gear lever assembly: Check and renew gear lever assembly.
- (3) Bent gear lever control rod, worn control rod universal joints or control rod out of adjustment: Renew faulty components and adjust control rod.
- (4) Worn selector mechanism in selector cover: Overhaul cover selector mechanism.
- (5) Worn transaxle selector mechanism: Remove selector cover and check transaxle selector mechanism, overhaul transaxle if necessary.



Check the friction surface of the synchro rings and cones for wear or damage.

- (6) Insufficient gear lever assembly lubrication: Check and lubricate gear lever assembly components.
- (7) Faulty gear synchroniser mechanism: Check and overhaul transaxle, renew faulty components as necessary.
- (8) Lubricating oil too heavy: Drain the transaxle case and refill with the correct grade and quantity of oil.
- (9) Excessive end float in the mainshaft gears or laygear: Check and overhaul the transaxle.

NOTE: First check the clutch for correct operation. If reverse gear can be selected without any sign of gear 'clash' this is a fairly good indication that the clutch is operating normally.

Also check that the correct type and viscosity oil is used in the transaxle as this can also cause difficult gear changing.

SLIPPING OUT OF GEAR

- (1) Worn gear control rod assembly bushes: Check and renew control rod assembly components as necessary.

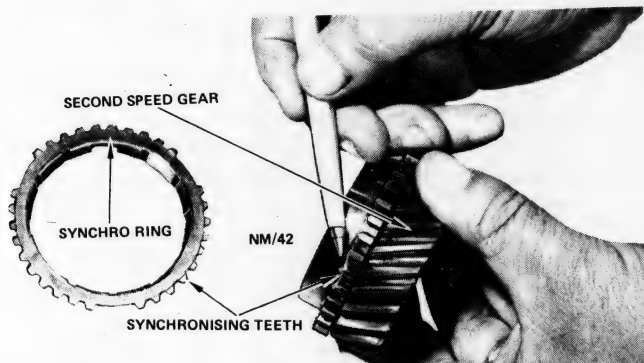
- (2) Gear control rod incorrectly adjusted: Check and adjust gear control rod.
- (3) Faulty gear synchroniser mechanism: Overhaul transaxle, renew faulty components as necessary.
- (4) Worn selector mechanism: Check and overhaul transaxle, renew faulty components as necessary.
- (5) Excessive end float in the laygear or mainshaft gears: Overhaul transaxle, renew components as necessary.
- (6) Weak or broken detent springs or missing detent spring caps: Renew the components as necessary.
- (7) Worn detent plungers or detent plunger grooves: Renew faulty components as necessary.

NOTE: In most cases, slipping out of gear is caused by wear, or damage to internal components of the transaxle. However, prior to removing and dismantling the transaxle check the engine mounting rubbers and the mounting hardware as vibrations caused by deteriorated mountings can cause the transaxle to slip out of gear.

GEARS CLASH ON CHANGING DOWN

- (1) Faulty clutch or clutch release mechanism: Check, adjust or overhaul the clutch or the clutch release mechanism.
- (2) Faulty synchro rings and cones: Overhaul the transaxle assembly.
- (3) Lubricating oil too heavy: Drain the transaxle case and refill with the correct grade and quantity of oil.
- (4) Broken, weak or incorrect positioning of the synchro springs on the synchro assembly: Overhaul the transaxle assembly.
- (5) Excessive end float in the mainshaft gears and/or laygear: Overhaul the transaxle assembly.

NOTE: Here again check the clutch for correct operation as previously outlined before removing the transaxle for dismantling and inspection. Also check that the correct type of transaxle oil is being used.

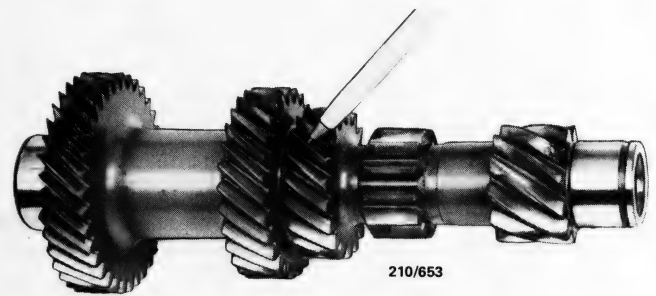


Check the synchronising teeth on the gears and synchro rings for chipping or wear.

TRANSAXLE NOISE (IN NEUTRAL)

- (1) Lack of sufficient lubricant: Fill the transaxle with the correct grade and quantity of oil.
- (2) Worn laygear bearing(s): Overhaul transaxle and renew faulty bearings as necessary.
- (3) Chipped or pitted constant mesh gears: Overhaul transaxle and renew faulty components.
- (4) Worn caged needle roller bearings on the mainshaft: Overhaul the transaxle and renew faulty bearings:

NOTE: First check the oil level in the transaxle. To isolate transaxle noise in neutral, run the engine, depress the clutch and engage any gear. If the noise ceases with the clutch depressed it is indicated that the noise is in the transaxle.



Check the laygear teeth for wear, pitting or damage.

TRANSAXLE NOISE (FORWARD GEARS ENGAGED, VEHICLE MOVING)

- (1) Lack of sufficient lubricant: Fill the transaxle with the correct grade and quantity of oil.
- (2) Worn laygear or mainshaft bearings: Overhaul the transaxle and renew faulty bearings.
- (3) Chipped or pitted gears: Check and overhaul the transaxle and renew faulty gears.



If the bearings are caged and can not be checked visually, wash thoroughly in clean solvent, lightly oil and turn slowly by hand to check for roughness.

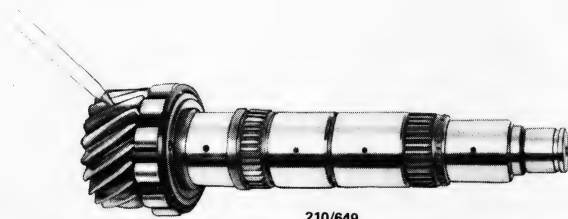
(4) Worn caged needle roller bearings on the mainshaft: Renew bearings as necessary.

(5) Damaged or worn synchroniser assemblies: Overhaul transaxle and renew synchroniser assemblies.

FINAL DRIVE GEAR NOISE

(1) Lack of sufficient lubricant: Fill the transaxle case with the correct grade and quantity of oil.

(2) Chipped or pitted final drive gear and/or ring gear: Overhaul the transaxle and renew components as necessary.



Check the integral final drive pinion teeth for wear or damage.

(3) Worn differential carrier bearings: Overhaul the differential assembly.

(4) Worn mainshaft or laygear bearings: Overhaul the transaxle.

NOTE: First check the oil level in the transaxle case, also check the condition of the front hub bearings and drive shaft joints prior to overhauling the transaxle.

EXCESSIVE BACKLASH IN FINAL DRIVE

(1) Excessive end float in differential carrier bearings due to worn or incorrect bearing preload adjustment: Check and adjust bearing preload or renew bearings.

(2) Ring gear to differential case bolts loose: Remove transaxle oil pan and tighten bolts to the specified torque.

(3) Excessive wear in final drive gear: Check and overhaul transaxle.

(4) Excessive wear in differential pinions and side gears or pinion shaft: Overhaul the differential assembly.

NOTE: Prior to overhauling the differential, check the serviceability of the C.V. joints on the drive shafts.

NO DRIVE IN ANY GEAR

(1) Sheared ring gear to differential case bolts: Overhaul differential assembly.

(2) Broken drive shaft: Check and renew components as necessary.

(3) Inner C.V. joint shaft out of mesh with differential side gear: Weak or broken inner C.V. joint shaft snap ring, renew as necessary.

NOISE OR VIBRATION IN DRIVE SHAFTS

(1) Bent or twisted drive shafts: Check and renew drive shafts as necessary.

(2) Damaged, loose or missing dynamic damper: Renew or tighten dynamic damper.

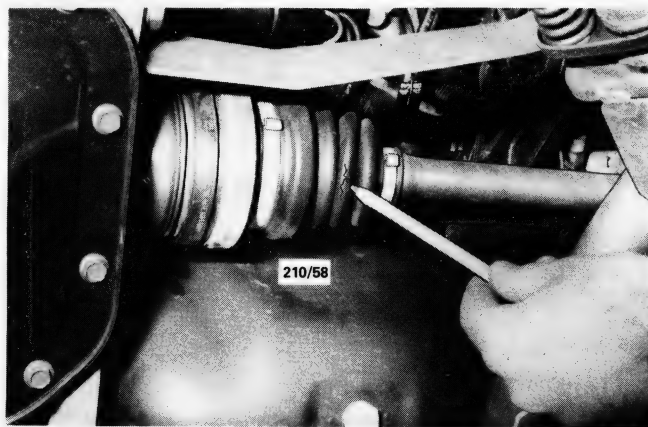
(3) Worn or damaged inner or outer C.V. joint: Check and renew components as necessary.

(4) Lack of lubricant due to damaged C.V. joint boots: Check the C.V. joints for wear, repack the C.V. joints and renew the C.V. joint boot.

(5) Loose drive shaft hub nut: Tighten the hub nut to Specifications.

(6) Worn splines on drive shaft or C.V. joint inner race. Check and renew faulty components or drive shaft as an assembly.

NOTE: Noise or vibration in the front end can also be caused by excessive tyre or wheel unbalance.



Check the C.V. joint dust boots for damage and deterioration.

2. DESCRIPTION

Four and five speed transaxle types are utilised in the Camira range of vehicles as covered by this manual. The construction of these two transaxles is in many ways identical, therefore the following description covers both transaxle types.

The transaxle has synchromesh on all forward gears. The forward gears are helical cut and run in constant mesh with the laygear. Reverse gear is selected by engaging a sliding reverse idler gear with the laygear and mainshaft reverse gears.

On the five speed transaxle, the mainshaft is extended to allow a fifth gear and a fifth gear synchro assembly to be accommodated. The laygear is also machined to accept a fifth gear.

To support the mainshaft and the laygear in the transaxle case ball bearings are installed to the rear and roller bearings to the front.

Construction of the transaxle is such that the mainshaft and laygear assemblies, together with the clutch

shaft, should be removed from the transaxle case as a unit and then dismantled from the end cover (four speed) or from the carrier plate (five speed) in which they are supported.

The transmission and the differential assemblies are accommodated in the same case, the same oil is used and the one oil level check covers both assemblies.

Gear selection is by means of selector forks and shafts which are operated by a floor mounted gear lever assembly via a control rod through a selector mechanism assembly.

The differential and final drive assembly runs on two tapered roller bearings. Provision to adjust bearing preload is made through an adjustable bearing retainer. The differential assembly is driven by the mainshaft final drive pinion gear via a ring gear.

The drive shafts are engaged with the differential side gears at the inner ends and with the front wheel hubs at the outer ends.

The drive shaft and each C.V. joint can be renewed as a single unit. The C.V. joints are prepared with lubricant and need no attention in service unless one of the boots has been damaged, then the joints may be cleaned and repacked with the recommended grease and a new boot fitted. The C.V. joints can not be overhauled.

A vibration damper is fitted to the right hand side drive shaft on manual transaxles only.

3. FOUR SPEED TRANSAXLE ASSEMBLY

Special Equipment Required:

To Dismantle - Press and press plates, filister head screw tool, suitable slide hammer and attachments, bearing puller, 36 mm socket

To Assemble - Press and press plates, filister head screw tool, spring scale, suitable heat source, 36 mm socket, guide pins

TO REMOVE AND INSTAL

(1) Raise the engine bonnet and fit fender covers to both front fenders.

(2) Disconnect the negative battery terminal.

(3) Loosen the retaining bolts on both front road wheels and mark the relationship between the front road wheels and the wheel hubs.

(4) Ensure that the steering lock is released and the transaxle is in neutral.

(5) Disconnect the speedometer cable from the transaxle.

(6) Withdraw the clutch cable retaining clip at the clutch release lever, loosen the clutch cable adjusting nut and disconnect the clutch cable from the clutch release lever.

(7) Disconnect the electrical wires from the reverse lamp switch.

(8) Loosen the bolt on the gear control rod retaining clamp, mark the position of the gear control rod in

relation to the selector rod and disconnect the rods from each other.

(9) Raise the front of the vehicle and support on chassis stands as described in the Wheels and Tyres section.

(10) Remove the front road wheels retaining bolts and withdraw the wheels from the wheel hubs.

(11) Disconnect both front suspension control arm ball joints from the steering knuckles and the steering gear tie rod ball joints from the steering arms as described in the Front Suspension section.

(12) Disconnect the stabiliser bar link from the left hand side suspension control arm.

(13) Remove and discard the six bolts retaining the left hand suspension control arm and carrier assembly and withdraw the assembly from the vehicle.

(14) Using a suitable drain tin, drain the oil from the transaxle assembly by removing the bolts retaining the transaxle oil pan to the transaxle case and removing the oil pan. Discard the oil pan gasket. Loosely instal the transaxle oil pan after the oil has drained.

(15) Position two suitable levers, equally spaced, behind the drive shaft inner C.V. joints, then lever the drive shafts out of the transaxle assembly taking care not to damage the drive shaft oil seal in the oil seal retaining flange on the right hand side of the transaxle case.

(16) Suitably support the drive shafts to the vehicle body with tie-wire.

(17) Support the engine on a suitable jack with a block of wood between the engine sump and the jack head to protect the sump.

(18) Slightly raise the engine, enough to take the weight of the assembly off the engine mountings.

(19) Remove the bolts retaining the torque reaction damper bracket to the torque reaction damper and to the transaxle. Remove the torque reaction damper bracket from the vehicle.

(20) Remove the left hand side rear engine mounting bracket retaining bolts from the engine mounting and the transaxle. Remove the mounting bracket from the vehicle.

(21) Remove the bolts retaining the exhaust pipe support bracket to the transaxle and swing the support bracket away from the transaxle.

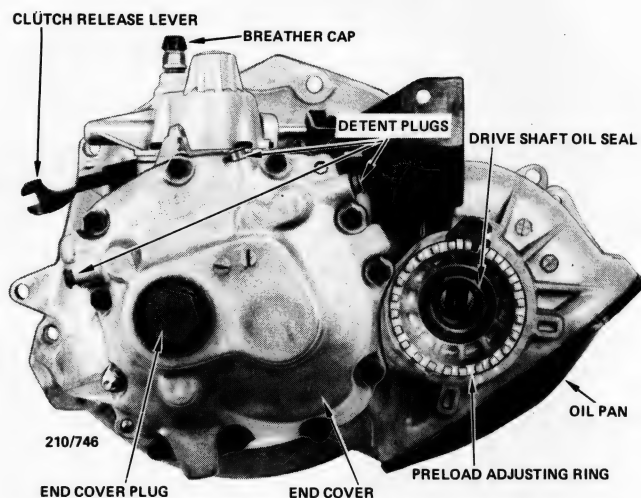
(22) Remove the clutch housing cover retaining bolts and remove the cover from the clutch housing.

(23) Support the transaxle assembly with a jack and, ensuring that the engine is well supported, remove the bolts which retain the transaxle to the engine assembly.

(24) Withdraw the transaxle from the engine assembly and remove the transaxle from the engine compartment by lowering it to the ground. Remove the transaxle from beneath the vehicle.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Ensure that the splines on the clutch shaft are clean and lightly lubricated with a suitable grease. Also



End view of transaxle assembly removed from vehicle.

apply a small amount of grease to the clutch shaft spigot bearing.

(2) Instal and tighten the transaxle retaining bolts to Specifications, ensuring that the locating dowels on the engine block correctly enter the locating holes in the transaxle case.

(3) Tighten the engine mounting bracket and the torque reaction damper bracket retaining bolts to Specifications. Check the clearance on both sides of the torque reaction damper as described in the Engine section.

NOTE: Do not tighten the control rod retaining clamp bolt until the engine mounting and torque reaction damper retaining bolts are tightened.

(4) Ensure that the snap rings on the inner C.V. joints engage fully in their locating grooves in the differential side gears. Check by pulling on the drive shafts.

(5) Use new mirco-encapsulated retaining bolts when installing the suspension control arm and carrier assembly to the vehicle body frame.

(6) Check and adjust the gear selector linkage as outlined under the heading Gear Selector Control Rod Assembly in this section.

(7) Instal and adjust the clutch cable free play as described in the Clutch section.

(8) Refill the transaxle with the specified grade and quantity of oil, refer to the Lubrication and Maintenance section. After the refilling has been completed check that the transaxle breather cap is free to rotate.

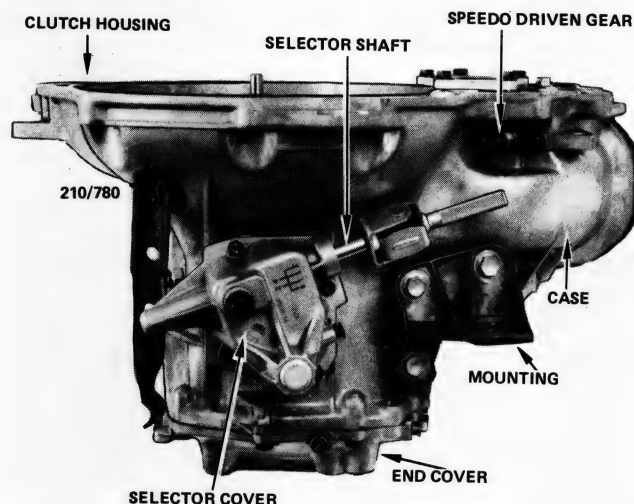
TO DISMANTLE

Transmission Assembly

(1) With the transaxle assembly removed from the vehicle as previously described, thoroughly clean the outer surfaces of the transaxle assembly.

(2) Remove the breather plug from the selector cover assembly.

(3) Remove the bolts retaining the selector cover



Top view of transaxle assembly removed from vehicle.

assembly to the transaxle case and remove the selector cover from the transaxle case.

(4) Remove the reverse lamp switch from the transaxle case.

(5) Remove the transaxle case oil pan retaining bolts and remove the oil pan from the transaxle case. Drain any remaining oil from the transaxle.

(6) Mark the installed position of the bolt stud, remove the transaxle end cover retaining bolts and carefully withdraw the end cover and the gear assemblies from the transaxle case.

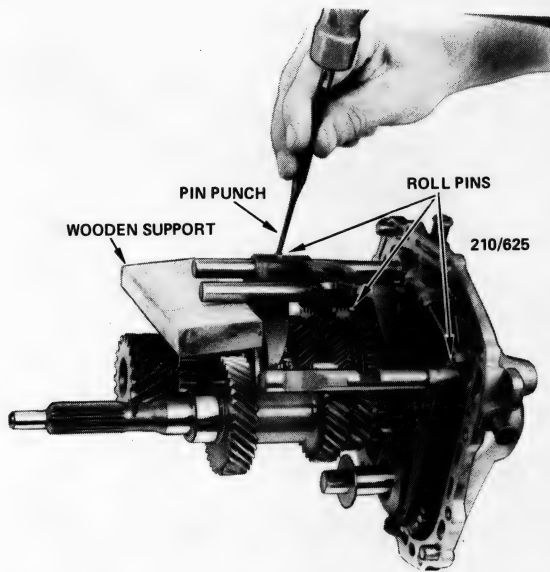
NOTE: If the end cover is tight on the end cover locating dowels, use a soft faced hammer to tap the end cover free from the locating dowels on the transaxle case by tapping on the lugs provided. Never use a screwdriver or similar tool as a wedge between the end cover and the transaxle case.

(7) Remove the gasket and the magnet from the end cover. Using a 36 mm socket remove the end cover plug from the end cover.

(8) Using a slide hammer and a suitable attachment withdraw the detent plunger plugs from the end cover. Withdraw each plug and the detent plunger and spring behind the plug, one at a time. Keep the components in order so they can be installed to the same bore from which they were removed.

NOTE: Do not try to remove the plugs from the end cover by tapping them sideways and outwards as the end cover will be damaged.

(9) Using a hammer and a suitable pin punch remove the roll pins which retain the selector forks to the selector shafts. Place a piece of wood between the selector shafts and the gears to brace the selector shafts to avoid strain to the selector shafts and their guides in the rear cover.

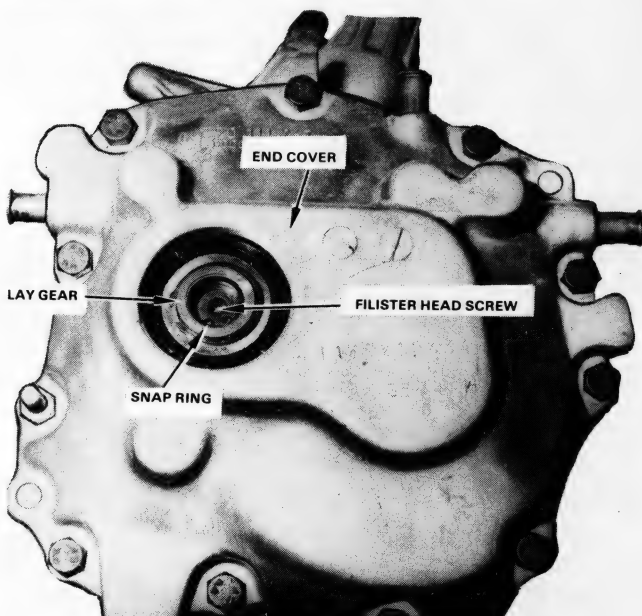


Method of removing the roll pins from the selector shafts.

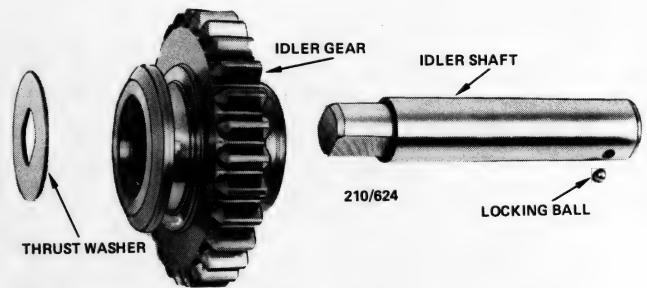
(10) Position the third and fourth gear synchro sleeve in the neutral position and withdraw the third and fourth gear selector shaft and fork, and the reverse gear selector shaft and fork from the end cover.

(11) Using suitable snap ring pliers squeeze together the snap rings which retain the mainshaft and the laygear assemblies to the transaxle end cover and lift the snap rings out of their locating grooves.

(12) Lift out together the mainshaft assembly, the laygear assembly, the reverse idler gear, the first and second gear selector fork and the selector shaft from the transaxle end cover.



View of transaxle end cover showing snap ring and filister head screw at rear of clutch shaft. End cover plug removed.



View of the reverse idler gear and components.

(13) After withdrawing the assemblies from the transaxle end cover, separate each assembly and place on a clean working area.

(14) Remove the interlock pins from the transaxle end cover noting their installed positions. Remove the large snap ring from the mainshaft assembly.

(15) Remove the reverse idler gear shaft from the transaxle end cover by placing the shaft in a vice with its jaws protected and tap the end cover off the shaft using a hammer and suitable wood drift. Ensure not to lose the shaft locking ball.

(16) Remove the snap ring from the rear of the laygear bore.

(17) Using the filister head screw tool, remove the filister head screw from the rear of the laygear.

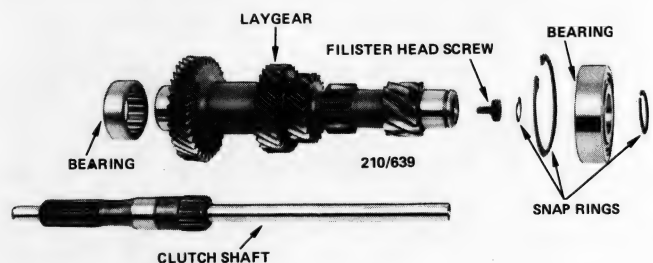
(18) Using a hammer and a soft drift tap the clutch shaft out from the rear of the laygear.

(19) Remove the laygear rear bearing to laygear retaining snap ring and using a press and press plates, press the bearing off the laygear. Remove the large rear bearing snap ring from the laygear.

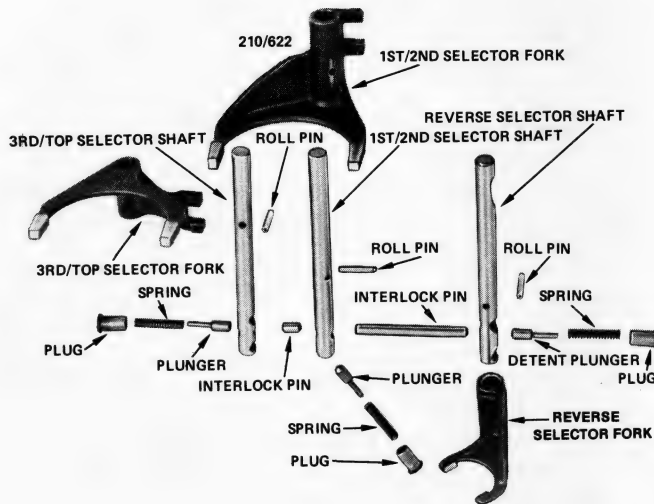
NOTE: Discard the laygear rear bearing as the only way to remove the bearing from the laygear is by pressing on the bearing outer race. This renders the rear bearing unserviceable.

(20) Remove the snap ring retaining the mainshaft rear bearing to the mainshaft.

(21) Using a press and press plates support the first gear on the press plates and press the first gear off the mainshaft together with the first gear needle roller thrust bearing and thrust plate and the mainshaft ball bearing, then remove the first gear needle roller and the first gear synchro ring from the mainshaft.



Dismantled view of clutch shaft, laygear and components.



Dismantled view of selector mechanism.

(22) Remove the snap ring retaining the first and second gear synchro assembly hub to the mainshaft.

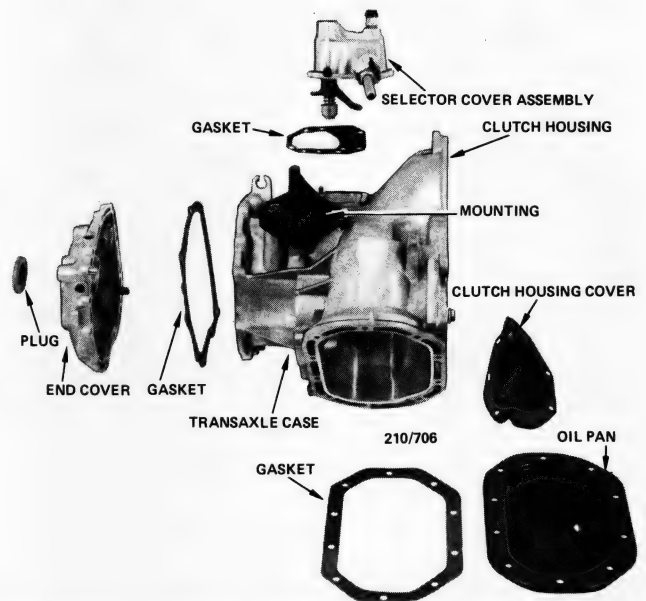
(23) Support the second gear on press plates and press the second gear together with the first and second gear synchro assembly off the mainshaft. Remove the second gear needle roller bearing and the second gear synchro ring from the mainshaft.

(24) Note the relationship of the first and second gear synchro assembly to the mainshaft after it has been removed from the mainshaft and instal the synchro rings to their respective sides on the synchro assembly.

(25) Remove the thrust washer retaining ring, the two thrust washer halves, the third gear, the third gear synchro ring and the third gear needle roller from the mainshaft.

(26) Remove the snap ring and the washer retaining the third and fourth gear synchro assembly hub to the mainshaft.

(27) Support the fourth gear on press plates and



Dismantled view of transaxle case components.

press the fourth gear and the third and fourth gear synchro assembly together with the needle roller bearing and fourth gear synchro ring off the mainshaft.

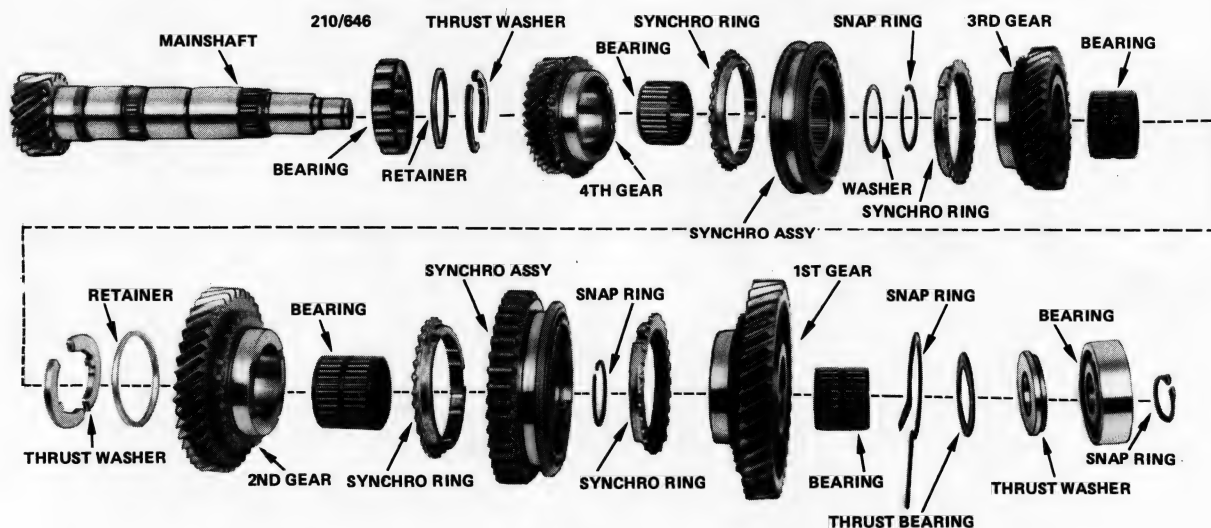
(28) Withdraw the two halves of the thrust washer, the thrust washer retaining ring and the mainshaft front roller bearing cage from the mainshaft.

(29) Remove the bolt retaining the clutch release fork to the clutch release shaft.

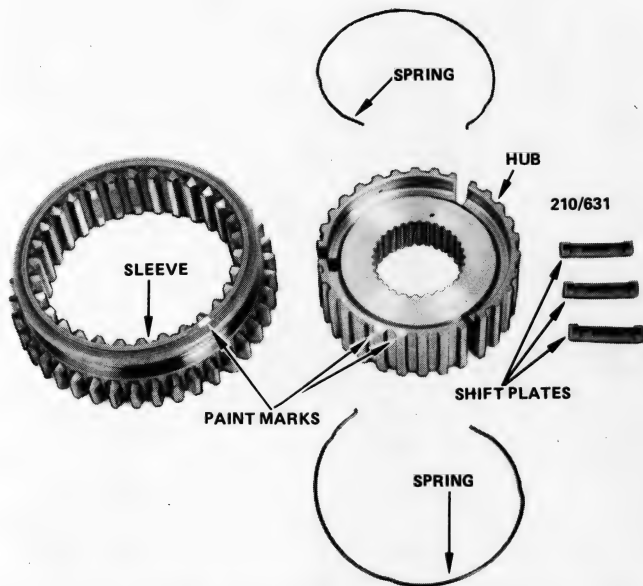
(30) Withdraw the clutch release shaft and lever assembly from the clutch housing and remove the clutch release bearing and carrier assembly with the clutch release fork from the clutch housing.

(31) Remove the bolts retaining the clutch release bearing guide to the clutch housing and remove the release bearing guide and the 'O' ring from the clutch housing.

(32) Working from the clutch housing end of the



Dismantled view of mainshaft and components.

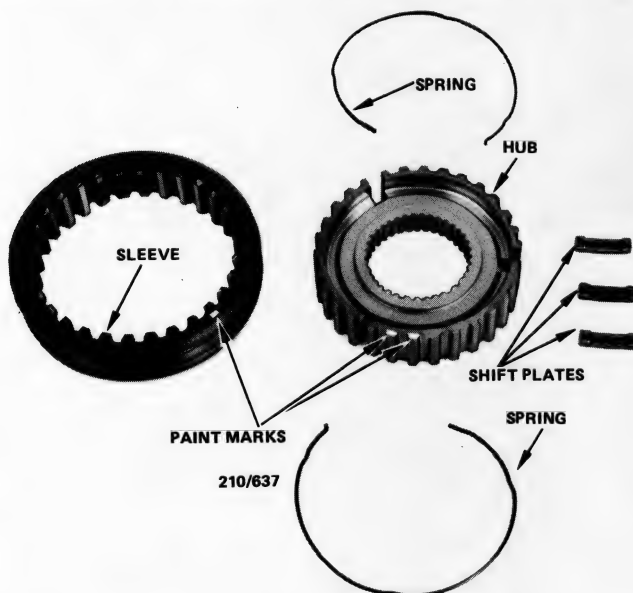


Dismantled view of 1st/2nd gear synchro assembly. Note that the sleeve is also reverse gear.

case and using a hammer and a suitable drift tap the lay-gear front bearing from the transaxle case.

NOTE: If the synchro assemblies or the synchro rings are not being renewed it is recommended that the synchro assemblies and the synchro rings are suitably marked to ensure that the components are replaced to their original positions. Do not intermix the components of the first and second gear synchro assembly with the components of the third and fourth gear synchro assembly.

(33) Mark the relationship of the first and second synchro hub to the synchro sleeve. Remove the synchro



Dismantled view of the 3rd/top gear synchro assembly.

springs and the shift plates and slide the sleeve off the synchro hub.

(34) Mark the relationship of the third and fourth gear synchro hub to the synchro sleeve. Remove the synchro springs and the shift plates and slide the synchro sleeve off the synchro hub.

(35) To remove the mainshaft front bearing outer race, if necessary, the differential assembly must be removed first.

Differential Assembly

(1) Remove the speedometer cable driven gear retaining bolt and plate and prise the speedometer driven gear from the transaxle case.

(2) Suitably mark the relationship of the differential carrier bearing adjusting ring to the transaxle case.

(3) Firmly grasp the differential ring gear and move the differential assembly from side to side and check if any bearing axial free play is present.

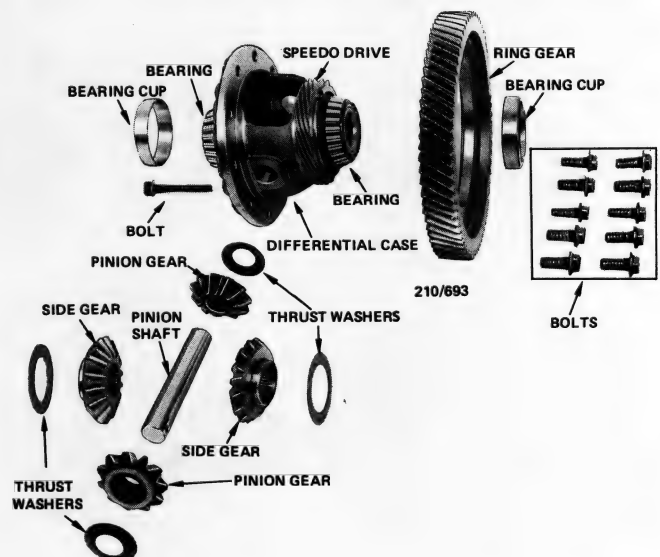
NOTE: The differential bearing axial play, if any, does not have to be measured, but if any axial free play is present at all, this will need to be remembered during assembly of the differential assembly.

(4) Remove the bolt and the lock plate retaining the adjusting ring and using a suitable tool unscrew the adjusting ring from the transaxle case. Remove the 'O' ring from the adjusting ring.

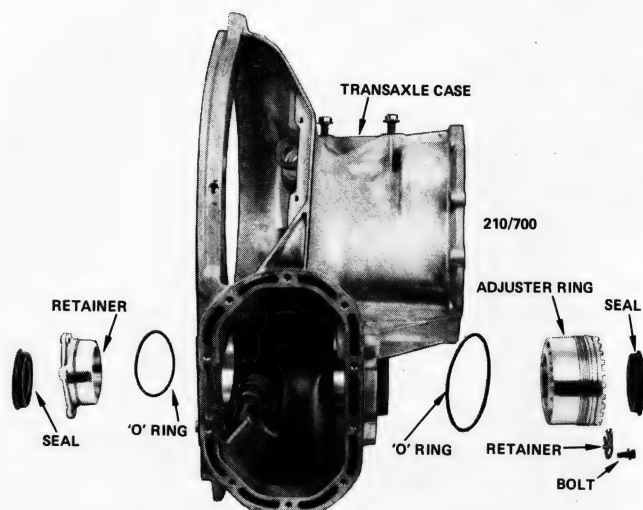
(5) Remove the bolts retaining the opposite side retaining flange from the transaxle case and gently prise the retaining flange from the transaxle case. Remove the 'O' ring from the retaining flange.

(6) Withdraw the differential assembly from the transaxle case.

(7) Using a suitable slide hammer and attachment



Dismantled view of differential and final drive assembly.



Dismantled view of differential bearing retainer and adjuster ring and associated components.

remove the mainshaft front bearing outer race from the transaxle case towards the rear of the case.

(8) If no further repairs are needed to the differential assembly, wrap up the assembly to prevent entry of dirt and put aside until needed. If the differential assembly needs overhauling proceed as follows:

(9) Place the differential case ring gear in a vice with its jaws protected and remove the ring gear retaining bolts.

(10) Using a suitable brass drift and a hammer remove the ring gear from the differential case by progressively tapping on the ring gear in a diagonal sequence.

(11) Remove the pinion gear shaft retaining bolt from the differential case and withdraw the pinion gear shaft from the differential case.

(12) Manoeuvre the pinion and the side gears in turn from the differential case noting the installed position of each respective thrust washer.

(13) If the differential carrier bearings are to be renewed split the speedometer drive gear with a suitable cold chisel and remove the drive gear from the differential case.

(14) Using a suitable bearing puller, withdraw the differential case carrier bearings from the case.

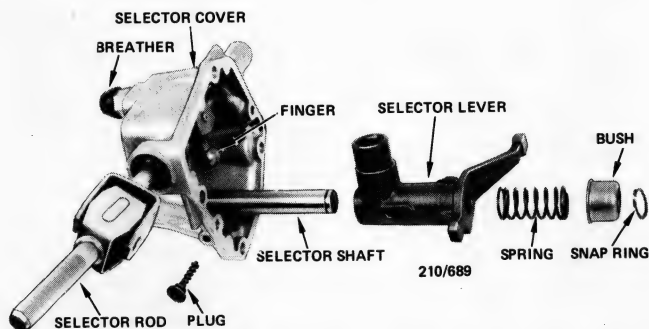
(15) With a suitable drift and hammer tap the oil seals and the carrier bearing outer races from the bearing retaining flange and from the bearing adjusting ring.

Selector Cover

(1) Working on the selector cover assembly remove the snap ring, the bush, the spring and the selector lever from the selector lever shaft.

(2) Position the selector finger retaining pin over the deepest section of the selector cover and using a suitable pin punch and hammer remove the retaining pin from the selector finger.

(3) Slide the selector rod out of the selector cover and remove the selector finger from the selector cover.



Dismantled view of selector cover and associated components.

(4) Prise the selector rod seal from the selector cover.

(5) If it is necessary to renew the selector rod rubber universal joint, grind off the head of the universal joint pivot pin and remove the universal joint and the pivot pin from the selector rod.

TO CLEAN AND INSPECT

(1) Wash all the transaxle components thoroughly in a suitable cleaning solvent and allow to dry.

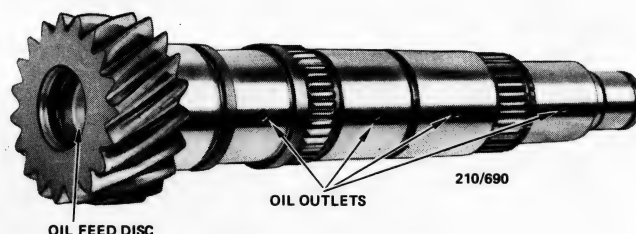
(2) Inspect the needle roller bearings outer races for pitting and damage. Inspect the needle roller bearing cages for damage and the needle rollers for pitting.

(3) Check all the thrust washers for wear and pitting.

NOTE: As the laygear rear ball bearing could not be removed by pressing on the inner race of the bearing, the rear bearing must be renewed. It is therefore advisable to renew both the mainshaft and the laygear rear bearings. Also it is recommended if the vehicle has seen considerable service that the needle roller bearings, the thrust bearings, the thrust washers and the snap rings also be renewed as a matter of course.

(4) Inspect the transaxle case, the end cover and the selector cover for cracks and damage. Ensure that the oil feed passages in the front of the transaxle case are unobstructed.

(5) Inspect the synchro rings for widened slots, rounded teeth and smooth internal surfaces.



View of mainshaft showing oil feed pick up disc and oil gallery outlets.

(6) Inspect the teeth on all gears, including the teeth on the differential gears and the ring gear for wear, pitting and burrs.

(7) Inspect all the synchro assembly components for wear and damage, particular attention should be given to the shift plates and springs.

(8) Inspect all the selector forks, the selector shafts, the selector lever and finger for damage and wear.

(9) Inspect the detent springs, the detent plungers and the interlock plungers for wear and damage. Compare the free lengths of the detent springs with new detent springs.

(10) Renew all the oil seals and the 'O' rings and renew all worn and damaged components as necessary.

(11) Inspect the reverse idle gear shaft and bush for wear and damage.

(12) Check the clutch release shaft, the release shaft bushes and the release bearing for wear, roughness and damage.

TO ASSEMBLE

Assembly is a reversal of the dismantling procedure with attention to the following points:

Lubricate all the components during assembly with clean oil of the specified grade, except where noted. See Lubrication and Maintenance section.

Differential Assembly

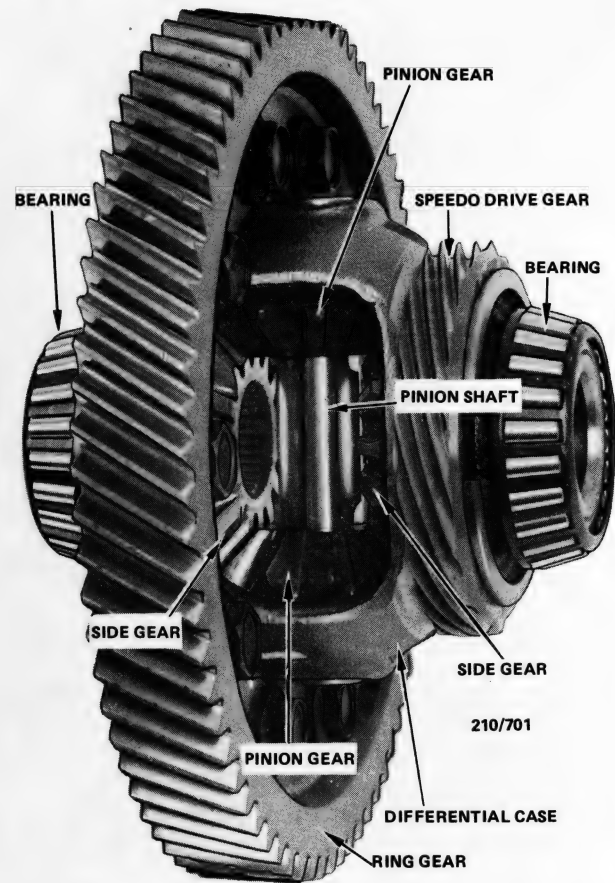
(1) Working on the differential assembly, insert each side gear with thrust washer into its respective side of the differential case, push the pinion gear shaft into the differential case slightly, slide a pinion gear with thrust washer into mesh with the side gears and push the pinion shaft through the thrust washer and the pinion gear.

(2) Before pushing the shaft fully into the differential case, slide the second pinion gear and thrust washer into mesh with the side gears and push the shaft through the gear and washer aligning the pinion shaft retaining bolt hole with the mating hole in the differential case. Instal the pinion shaft retaining bolt and tighten to Specifications.

(3) Place a new speedometer drive gear into a vessel filled with water. Heat the water to a temperature of 80 deg C, remove the speedometer drive gear from the vessel and ensuring that the locating lugs on the drive gear are faced downward instal the drive gear on the differential case engaging the locating lugs with the recesses in the differential case. The drive gear should snap into place and no tapping should be necessary.

(4) Instal two guide pins, slightly longer than the ring gear retaining bolts, into the ring gear retaining bolt holes in the differential case.

(5) Evenly heat the ring gear to a temperature of 80 deg C and using pliers place the ring gear onto the differential case ensuring that the machined face of the ring gear is facing the mounting flange on the differential case. Draw the ring gear evenly into position with the ring gear retaining bolts. Remove the guide pins and instal the



Assembled view of differential and final drive assembly.

remaining retaining bolts. Do not finally tighten the ring gear retaining bolts to Specifications until such time the ring gear has fully cooled down.

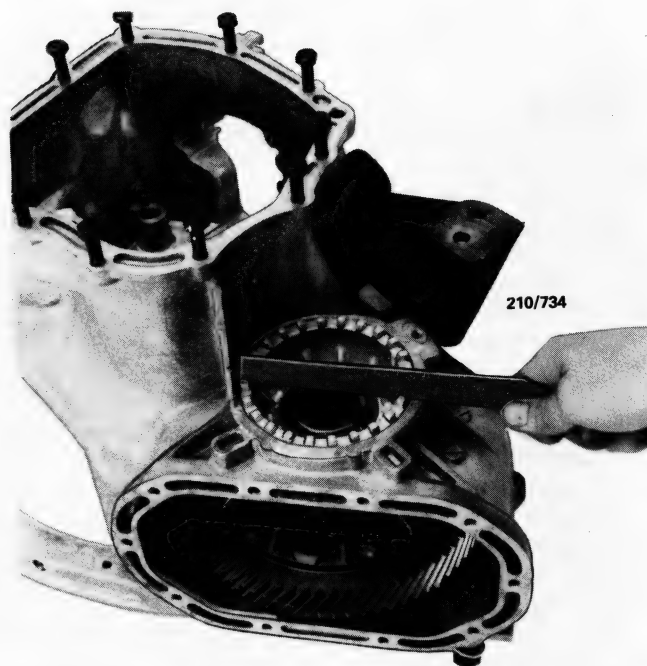
NOTE: Before proceeding with the installation of the differential carrier bearings ensure that if the original bearings are being refitted they are installed to the side from which they were removed. Also ensure that each bearing cup is fitted to its correct bearing cone.

(6) Without placing pressure on the bearing roller cage and rollers press the bearings on the ends of the differential case using a suitable press.

(7) Using a press and a suitable adaptor instal the carrier bearing cups to the differential retaining flange and to the differential adjusting ring ensuring that their tapers will face the bearing cones.

(8) Pack a small amount of lithium based grease into the drive shaft oil seal cavities and using a suitable drift drive the oil seals squarely into the differential bearing retaining flange and the differential bearing adjusting ring in turn ensuring the seal lips are faced towards the differential carrier bearings when installed.

(9) Coat the differential flange and the adjusting ring 'O' rings with lithium based grease and instal the 'O' rings to the differential flange and to the adjusting ring.



Method of adjusting differential carrier bearing preload.

(10) Apply a small amount of lithium based grease to the speedometer drive gear and instal the differential assembly into the transaxle case.

(11) Coat the bearing retaining flange bore with a small amount of lithium based grease and instal the retaining flange to the transaxle case. Instal the flange retaining bolts and tighten to Specifications.

(12) Apply lithium based grease to the thread on the bearing adjusting ring and instal the adjusting ring to the transaxle case ensuring the differential carrier bearing cones are aligned with the bearing cups in the bearing retaining flange and the bearing adjusting ring.

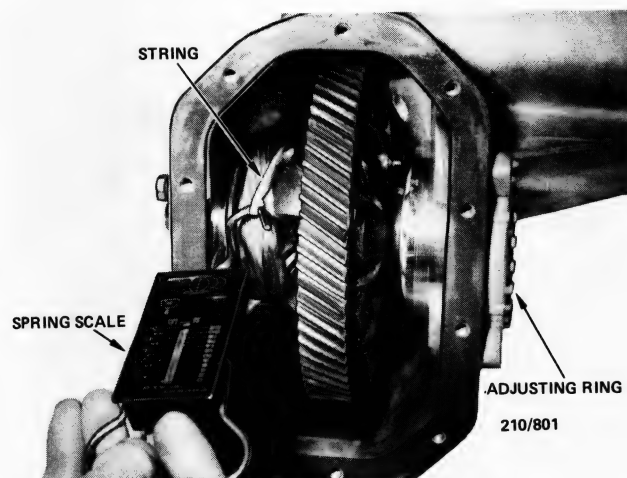
(13) Rotate the differential case while tightening the adjuster ring to seat the bearing cones into their corresponding cups. The extent to which the adjuster ring can be tightened and therefore the amount of bearing preload applied depends on the following situations.

(a) If the old differential case and the carrier bearings are installed and no axial free play was evident during dismantling the adjusting ring can be tightened to where the marks on the adjusting ring and the transaxle case made prior to dismantling are aligned.

(b) If the old differential case and the carrier bearings are reinstalled and axial free play was evident during disassembly or if new carrier bearings are being installed, attach one end of a suitable length of string to the differential case and wrap it around the circumference of the case behind the speedometer drive gear.

Attach a spring scale to the other end of the string. Tighten the adjusting ring to where a pulling force of 1.4–2.3 kg for old bearings or 3.4–5.7 kg for new bearings is needed to rotate the differential case one revolution per second.

(14) Instal the adjusting ring lock plate and the lock



Method of measuring differential carrier bearing preload using a spring scale.

plate retaining bolt and tighten the retaining bolt to Specifications.

(15) Coat both sides of a new transaxle case oil pan gasket with a suitable sealing compound and instal the gasket, the oil pan and the cover retaining bolts to the transaxle case. Tighten the retaining bolts to Specifications.

(16) Instal a new 'O' ring to the speedometer driven gear housing and instal the speedometer driven gear into the transaxle case. Instal the retaining bolt and plate and tighten the bolt to Specifications.

Transmission Assembly

(1) If the clutch release shaft bushes were removed from the clutch housing, instal new bushes, lower bush first, ensuring that the lugs on the bushes engage with the notches in the bush mounting lugs.

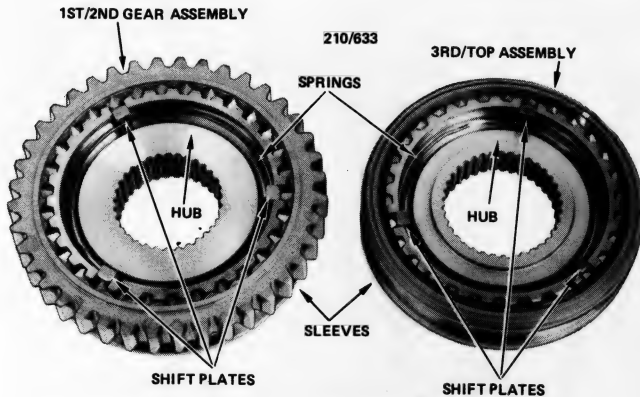
(2) Using a suitable drift and hammer, drive the mainshaft front bearing outer race into the transaxle case until the collar on the outer race bottoms on the transaxle case.

(3) Using a suitable drift and hammer, instal the laygear front bearing into the transaxle case with its lettered markings facing towards the inside of the transaxle case. Drive the bearing into the case until the bearing is flush with the transaxle case on the clutch housing side.

(4) Align the marks previously made on the first and second gear synchro assembly components and slide the sleeve onto the synchro hub.

(5) Slide the shift plates into the slots in the synchro hub and instal the synchro springs to the synchro assembly.

NOTE: The synchro springs must be installed so that when viewed from one side they travel in opposite directions and the hook end of each spring must be installed in the same shift plate. After assembly ensure that the sleeve slides smoothly, and correctly over the synchro hub.



Assembled view of synchroniser assemblies.

(6) Assemble the third and top gear synchro assembly in the same manner as the first and second gear synchro assembly as previously described.

(7) Install the mainshaft front bearing onto the mainshaft with the smaller side of the bearing facing the final drive gear.

(8) Install the two halves of the large thrust washer to the mainshaft ensuring that the locating tang on each half is located correctly in the mainshaft locating hole, then install the thrust washer retaining ring over the thrust washers.

NOTE: A small amount of grease will help to keep the thrust washer and the retaining ring in position.

(9) Install the top gear single row needle roller bearing to the mainshaft followed by the top gear and the top gear synchro ring.

(10) Place the third and top gear synchro assembly in position on the mainshaft ensuring that the small groove on the circumference of the synchro sleeve is facing towards the final drive gear.

(11) Using a press and press plates, and pressing on the inner circumference of the synchro hub only, press the third and top gear synchro assembly onto the mainshaft ensuring that the shift plates of the synchro assembly are engaged in the slots of the top gear synchro ring.

(12) Install the spacer washer and the new snap ring retaining the third and top gear synchro hub to the mainshaft.

(13) Install the third gear double row needle roller bearing onto the mainshaft followed by the third gear synchro ring and the third gear. Ensure the third gear synchro ring slots are engaged with the shift plates of the third and top gear synchro assembly.

(14) Using a small amount of grease install the two halves of the thrust washer onto the mainshaft ensuring that the locating tang on each half is correctly located in the mainshaft locating hole, then install the retaining ring over the thrust washers.

(15) Install the second gear needle roller bearing followed by the second gear and second gear synchro ring onto the mainshaft.

(16) Position the first and second gear synchro assembly onto the mainshaft with the selector fork groove on the synchro sleeve facing away from the mainshaft final drive gear.

(17) Using a press and press plates, and pressing on the inner circumference of the synchro hub only, press the first and second gear synchro assembly onto the mainshaft ensuring that the shift plates of the synchro assembly are engaged in the slots of the second gear synchro ring. Also ensure that the thrust washer and the retaining ring do not become dislodged from the mainshaft.

(18) Install a new snap ring to retain the first and second synchro hub to the mainshaft.

(19) Install the first gear needle roller bearing to the mainshaft followed by the first gear synchro ring and the first gear. Ensure the first gear synchro ring slots are engaged with the shift plates of the first and second gear synchro assembly.

(20) Position the first gear thrust bearing onto the mainshaft followed by the thrust washer with the groove on the thrust washer facing away from the first gear.

(21) Using a suitable snap ring pliers, squeeze together the ends of a new large mainshaft rear bearing snap ring and take note which way the outer edge of the snap ring is bevelled. Install the snap ring to the mainshaft so that the outer edge of the snap ring is bevelled away from the first gear.

(22) Using a press and press plates press the mainshaft rear bearing onto the mainshaft with the closed side of the bearing towards the rear and applying pressure on the bearing inner race only. Ensure that the large rear bearing snap ring does not become caught in between the first gear and/or the thrust bearing or thrust washer.

(23) Install a new small bearing retaining snap ring to the mainshaft groove.

(24) Position a new snap ring, to retain the laygear rear bearing to the transaxle end cover, onto the laygear.

NOTE: To determine the correct way the snap ring is to be installed, close the ends of the snap ring with suitable snap ring pliers and notice which way the outer edge of the snap ring is bevelled. The outer edge should bevel towards the transaxle end cover when installed.

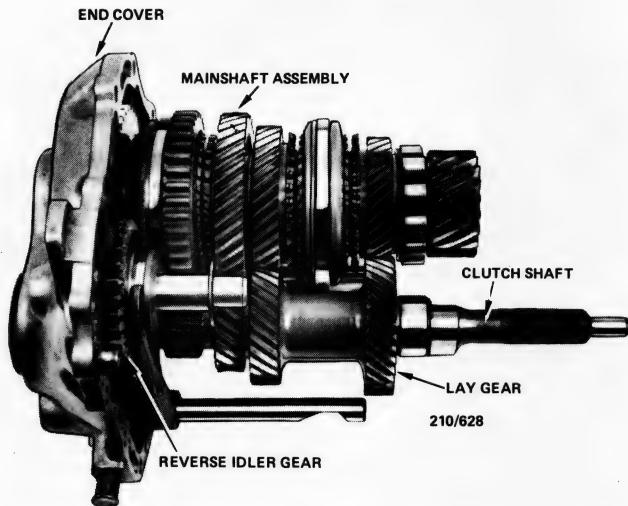
(25) Using a press and press plates press the laygear bearing onto the rear of the laygear ensuring to apply pressure onto the bearing inner race only.

(26) Install a new bearing retaining snap ring to the laygear.

(27) Install the clutch shaft into the laygear from the front of the laygear ensuring not to damage the clutch shaft splines and secure the clutch shaft with the filister head screw at the rear. Tighten the filister head screw to Specifications.

(28) Install the clutch shaft retaining snap ring into the rear of the laygear bore.

(29) Place the locking ball into the reverse idler gear



Assembled view of the mainshaft assembly, the laygear and reverse idler gear, installed to the rear cover.

shaft and instal the shaft and ball into its respective hole in the transaxle end cover.

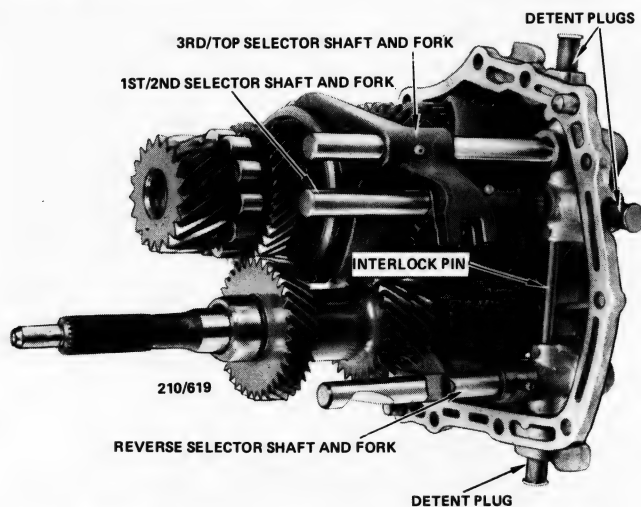
(30) Slide the reverse idler gear onto the shaft followed by the thrust washer. Ensure the selector fork groove on the idler gear is facing away from the end cover.

(31) Position the short interlock pin in between the first and second gear and the third and fourth gear selector shaft bores.

(32) Position the long interlock pin in between the first and second gear and the reverse gear selector shaft bores.

(33) Lift up the reverse idler gear a short distance and keep it supported with a small block of wood.

(34) Bring the laygear and the mainshaft assemblies together and hold them into mesh with each other, then enter the laygear and the mainshaft rear bearings into their respective bores in the end cover, but do not push them fully down.



View of gear assemblies and end cover removed from transaxle case showing positions of gear selector shafts and forks.

(35) With the large snap ring resting on top of the mainshaft rear bearing, squeeze the ends of the snap ring together with suitable snap ring pliers and push the mainshaft bearing, together with the snap ring, fully into the mainshaft bearing bore. Release the ends of the snap ring and ensure the snap ring is seated correctly in its groove.

NOTE: An alternative method to instal the snap ring is to compress the snap ring as much as the mainshaft diameter will allow, then tie the ends of the snap ring together with tie-wire. Instal the mainshaft bearing into the bearing bore together with the snap ring. Slacken the tie-wire and ensure the snap ring expands correctly into its groove. Remove the tie-wire.

(36) Lower the laygear bearing fully into the laygear bearing bore and instal the bearing retaining snap ring.

(37) Remove the block of wood from beneath the reverse idler gear.

(38) Instal the first and second gear selector fork to the first and second synchro sleeve, then slide the first and second gear selector shaft through the selector fork and into the end cover bore with one interlock pin groove each side and the three detent plunger notches facing upwards.

(39) Instal the third and fourth gear selector fork to the third and fourth gear synchro sleeve then slide the third and fourth gear selector shaft through the selector fork and into the end cover bore with the interlock pin notch facing the inside and the detent plunger notches facing the outside of the end cover.

(40) Instal the reverse gear selector fork to the reverse idler gear groove then slide the reverse gear selector shaft through the selector fork and into the end cover bore with the interlock pin notch facing the inside and the detent plunger notches facing the outside of the end cover.

(41) Align the roll pin holes in the selector forks with the holes in the selector shafts and instal the roll pins. The roll pins should be flush with the tops of the selector forks and the selector shafts should be braced with a piece of wood when installing the roll pins.

(42) Ensure all gears are in neutral then instal the detent plungers, the springs and the plugs into the relevant plunger bores as noted prior to removal. The plugs should be driven into the end cover until they are felt to bottom in their bores.

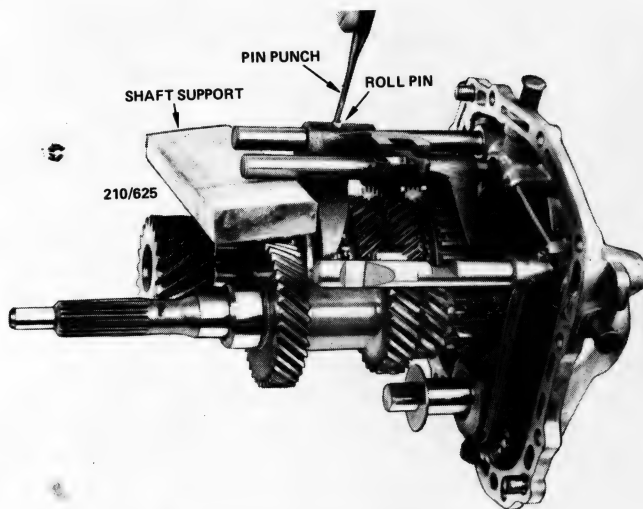
(43) Engage reverse gear and instal the magnet into the end cover slot near the reverse idler gear.

(44) Coat both sides of a new end cover gasket with a suitable sealing compound and place the gasket on the end cover gasket face.

(45) Ensure that the reverse lamp switch has been removed from the transaxle case.

(46) If available instal two guide pins, approximately 75 mm long, into the rear of the transaxle case.

(47) Instal the end cover and gear assemblies onto the guide pins and gently slide the assembly forward into



Method of installing selector shaft roll pins.

the transaxle case guiding the fronts of the mainshaft and the laygear assemblies into their correct locations.

NOTE: Do not let the rear cover gasket become dislodged from the rear cover as the magnet beneath the gasket may become attached to the reverse idler gear if reverse gear is not engaged.

(48) Push the assembly fully forward onto the locating dowels, remove the guide pins if installed and instal the cover retaining bolts. Tighten to Specifications.

NOTE: Ensure that the end cover bolt stud is installed to its correct position as marked on dismantling.

(50) If necessary renew the clutch release bearing guide oil seal and 'O' ring as described in the Clutch section.

(51) Instal the clutch release bearing guide and the 'O' ring to the transaxle case and instal the retaining bolts. Tighten the bolts to Specifications.

(52) Coat the release bearing guide sliding surface lightly with molybdenum disulphide grease.

(53) Instal the clutch release shaft and lever assembly to the clutch housing, push the assembly halfway in then instal the clutch release fork to the release shaft. Fully push the shaft into its correct position.

(54) Instal the clutch release bearing and carrier assembly to the clutch release fork.

(55) Instal the clutch fork retaining bolt ensuring that the retaining bolt enters its locating groove in the release shaft correctly. Tighten the retaining bolt to Specifications.

Selector Cover

(1) If the gear selector rod was previously disassembled and a new universal joint is to be fitted, apply a small amount of silicon grease to the universal joint and

instal the universal joint into the inner selector rod fork then instal the outer selector rod fork.

(2) Using the new replacement pin, instal the pin through the outer selector rod fork and the universal joint. Secure the pin with the retaining clip supplied.

(3) Smear the inner cavity of a new selector rod seal with grease and instal the seal into the selector cover using a suitable tubular drift or socket.

(4) Instal the selector lever onto the selector lever shaft, followed by the spring and spring bush. Retain the components with the snap ring.

(5) Place the selector finger into the selector cover, engaging the selector finger ball with the selector lever socket.

(6) Enter the selector rod assembly into the selector cover with the notch on the selector rod towards the selector lever shaft.

(7) Push the selector rod assembly forward and at the same time pushing the selector rod through the selector finger.

(8) Align the retaining pin hole in the selector rod with the hole in the selector finger and instal the retaining pin.

(9) Ensure that the transaxle is in neutral.

(10) Coat both sides of a new selector cover gasket with a suitable sealing compound and instal the gasket to the transaxle case.

(11) Instal the selector cover to the transaxle case ensuring that the gear selector lever tongues are located in the selector fork slots.

(12) Instal the selector cover retaining bolts and tighten to Specifications.

(13) Instal the reverse lamp switch.

4. FIVE SPEED TRANSAXLE ASSEMBLY

Special Equipment Required:

To Dismantle - Press and press plates, filister head screw tool, suitable slide hammer and attachments, bearing puller, suitable gear puller, 36 mm socket
To Assemble - Press and press plates, filister head screw tool, spring scale, suitable heat source, 36 mm socket, guide pins

TO REMOVE AND INSTAL

The removal and installation procedures for the five speed transaxle are identical to that which are fully described for the four speed transaxle.

TO DISMANTLE

The dismantling and assembling procedures for the five speed transaxle are almost identical to those which are fully described for the four speed transaxle.

Construction and repair differences to take into consideration when working on the five speed transaxle are as follows:

(1) Remove the breather plug, the selector cover and the reverse lamp switch from the transaxle as described for the four speed transaxle.

(2) Remove the bolts retaining the end cover to the bearing support plate and remove the end cover and the end cover gasket.

(3) Remove the bolts retaining the bearing support plate to the transaxle case.

(4) Using a soft faced hammer tap on the lugs on the bearing support plate to break the seal and to release the support plate from the dowels.

(5) Withdraw the bearing support plate and the gear assemblies from the transaxle case.

(6) Remove the magnet from the bearing support plate.

(7) Place the bearing support plate and the gear assemblies horizontally on a bench and suitably support the gear assemblies.

(8) Remove the screws retaining the fifth gear selector fork pivot post to the bearing support plate and remove the pivot post from the support plate.

(9) Mark or note the installed position of the tension spring on the fifth gear lock out assembly.

(10) Remove the screws retaining the fifth gear lock out assembly to the bearing support plate and remove the lock out assembly from the bearing support plate.

(11) Remove the lock out bracket to support plate retaining screws.

(12) Push the fifth gear selector rearwards, enough to remove the lock out bracket and the interlock pin from the bearing support bracket separately.

(13) Using a slide hammer and a suitable attachment withdraw the detent plugs from the bearing support plate.

NOTE: Withdraw each plug and the detent spring and plunger behind the plug, one at a time. Keep the components in order so they can be installed to the same bore from which they were removed.

(14) Using a hammer and a suitable pin punch remove the roll pins which retain the selector forks to the

selector shafts. Place a piece of wood between the selector shafts and the gears to avoid straining the selector shafts and their guides in the bearing support plate.

(15) With the roll pins removed, remove the third and fourth gear selector shaft and fork, and the fifth gear selector from the bearing support plate.

(16) Place the reverse gear in the neutral position and remove the first and second gear selector shaft and fork.

(17) Remove the reverse gear selector shaft and fork.

(18) Remove the interlock pin positioned between the reverse gear and the first and second gear selector shaft guides.

(19) Remove the snap ring securing the fifth gear synchro hub to the mainshaft.

(20) Using a puller withdraw the fifth gear synchro assembly from the mainshaft.

(21) Remove the fifth gear, the fifth gear needle roller bearing, the split thrust washer and the thrust washer retaining ring from the mainshaft.

(22) Remove the snap ring retaining the fifth drive gear to the laygear and using a puller withdraw the fifth drive gear from the laygear taking care not to damage the teeth of the gear.

(23) Compress the snap ring retaining the mainshaft rear bearing in the bearing support plate and lift the mainshaft and bearing slightly, so as not to allow the snap ring to snap back into its groove.

(24) Expand the snap ring retaining the laygear rear bearing in the bearing support plate. Lift up the mainshaft and the laygear assemblies, the reverse idler gear and the idler gear thrust washer out of the bearing support plate. The laygear rear bearing retaining snap ring may be released as soon as the groove on the rear bearing has passed the snap ring.

(25) Further dismantling of the mainshaft and the laygear assemblies and the differential unit is identical to the procedure described for the four speed transaxle taking into account the following.

(a) A spacer washer is installed behind the first and second gear synchro assembly retaining snap ring.

(b) Delete the removal of the snap rings retaining the rear bearings to the mainshaft and the laygear respectively as they were removed prior to removal of the fifth gear synchro assembly and the fifth drive gear.

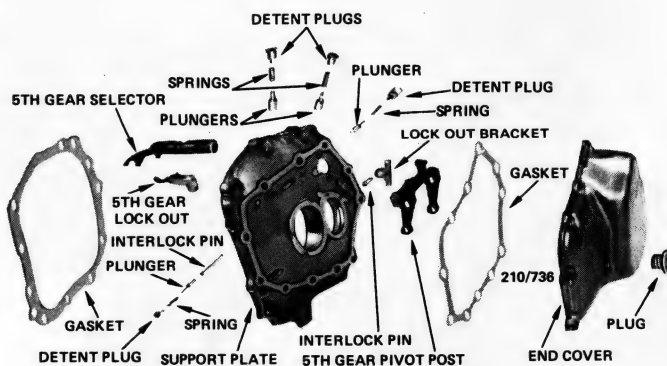
(c) The third gear bearing is a single row needle roller bearing as opposed to a double row bearing in the four speed transaxle.

TO ASSEMBLE

Assembly is a reversal of the dismantling procedure with attention to the following points:

(1) Assemble the laygear and the mainshaft assemblies as fully described for the four speed transaxle with attention to the following:

(a) Delete the installation of the small snap ring to the rear of the mainshaft.



Dismantled view of bearing support plate and 5th gear selector components.

(b) Delete the installation of the large and the small snap rings to the laygear.

(2) Place the locking ball into the reverse idler gear shaft and instal the shaft and ball into the bearing support plate using a soft faced hammer if necessary.

(3) Instal the reverse idler gear onto the shaft with the selector fork groove facing away from the bearing support plate, followed by the idler gear thrust washer.

(4) If removed, instal the laygear rear bearing retaining snap ring into the bearing bore in the bearing support plate.

(5) Lift up the reverse idler gear a small distance and support the idler gear with a suitable support.

(6) Bring the laygear and the mainshaft assemblies together and hold them into mesh.

(7) Enter the laygear rear bearing into the bearing bore in the bearing support plate. Expand the laygear bearing retaining snap ring and push the laygear bearing past the snap ring half way into its bore.

(8) Instal the mainshaft rear bearing into the bearing support plate bore and push the mainshaft downwards until the first gear on the mainshaft contacts the laygear rear bearing.

(9) Hold the mainshaft in this position by means of a suitable piece of wood.

(10) Now push the laygear rear bearing further into its bore until the snap ring is near to snapping into the bearing groove. Do not push any further.

(11) Compress the mainshaft rear bearing retaining snap ring ensuring the snap ring is resting on top of the bearing as this is the only position where the snap ring will compress enough to be installed in the bearing bore.

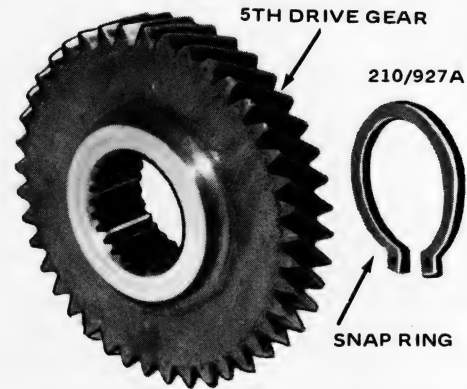
(12) Remove the piece of wood supporting the mainshaft and push the mainshaft rear bearing fully into its bore. Release the bearing retaining snap ring and ensure the snap ring is seated correctly in its groove, keeping in mind that the snap ring will not seat into its groove if it is not held against the bearing during installation.

NOTE: An alternative method to instal the snap ring is to compress the snap ring as much as the mainshaft diameter will allow, then tie the ends of the snap ring together with tie-wire. Instal the mainshaft bearing into the bearing bore together with the snap ring. Slacken the tie-wire and ensure the snap ring expands correctly into its groove. Remove the tie-wire.

(13) Push the laygear bearing down fully into its bore and ensure the snap ring is engaged correctly into the bearing groove.

(14) Using a suitable tubular drift press the fifth drive gear onto the rear of the laygear and secure the fifth drive gear with the retaining snap ring.

(15) If the fifth gear synchro assembly was dismantled, instal the shift plates to the slots in the synchro hub. Assemble the sleeve to the hub aligning the paint marks made prior to dismantling. Instal the energiser



View of 5th drive gear and gear retaining snap ring.

spring to the assembly with the spring facing the fifth gear and the spring tang hooked into a shift plate.

(16) Instal the two halves of the thrust washer onto the mainshaft with the tangs correctly engaged into the mainshaft holes and retain the two halves with the retaining ring.

(17) Instal the fifth gear needle roller bearing to the mainshaft followed by the fifth gear and fifth gear synchro ring.

(18) Press the fifth gear synchro assembly onto the mainshaft ensuring that the slots in the synchro ring align with the ends of the shift plates in the synchro assembly.

(19) Instal the synchro hub retaining snap ring to the mainshaft.

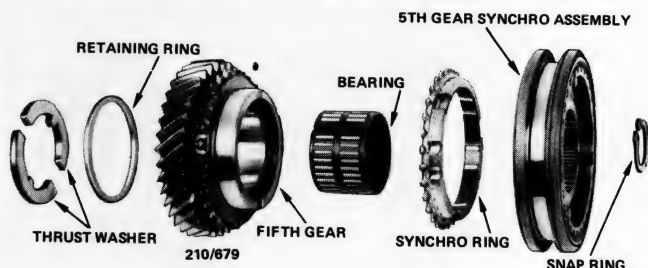
(20) Instal the interlock pin between the reverse and the first and second gear selector shaft bores.

(21) Instal the reverse gear selector shaft and fork to the support plate with the lock out notch facing the inside and the detent plunger notches facing the outside of the bearing support plate.

(22) Instal the first and second gear selector shaft and fork to the bearing support plate with one lock out pin notch on the shaft facing the outside and the other lock out pin notch facing the inside of the bearing support plate. The detent plunger notches should face towards the top.

(23) Instal the fifth gear selector into the bearing support plate bore.

(24) Instal the interlock pin and the interlock pin bracket to the rear of the bearing support plate. Move the fifth gear selector as required to ensure the interlock pin is



Dismantled view of the fifth gear and fifth gear synchro assembly and components.

correctly installed between the first and second and the third and fourth selector shaft bores.

(25) Instal and tighten the interlock pin bracket retaining screws to Specifications.

(26) Instal the third and fourth gear selector shaft and fork with the interlock notch on the shaft facing the inside and the three detent plunger notches on the shaft facing the outside of the support plate.

(27) Suitably support the selector shafts and align the holes in the selector forks with the holes in the selector shafts, then instal the roll pins until the roll pins are flush with the tops of the selector forks.

(28) Instal the detent plungers, springs and plugs into the same bore from which they were removed as noted prior to removal.

(29) Instal the fifth gear lock out assembly ensuring the ends of the tension spring on the lock out assembly are installed as marked during removal. Instal the lock out assembly retaining screws and tighten to Specifications.

(30) Instal the fifth gear selector fork pivot post assembly ensuring to correctly engage the selector fork tongue with the flat on the fifth gear selector. Also ensure that the shoes on the selector fork engage correctly into the groove of the synchro assembly sleeve. Instal the pivot post retaining screws and tighten to Specifications.

(31) Further assembly of the five speed transaxle is the same as outlined for the four speed transaxle.

5. GEAR LEVER ASSEMBLY

TO REMOVE

(1) Using the fingers only, prise the gear lever surround from the centre console, front end first.

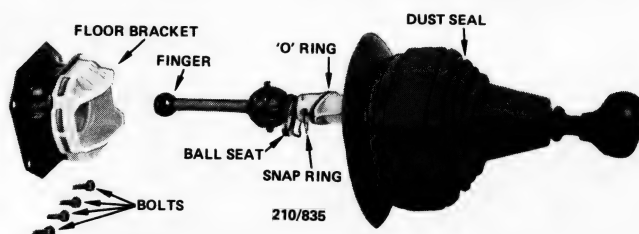
(2) With the gear lever in the neutral position prise the dust boot from the gear lever housing and slide the dust boot upwards on the gear lever.

(3) Close the ends of the gear lever retaining snap ring and remove the snap ring from the gear lever housing.

(4) Press the gear lever to the left and remove the gear lever from the gear lever housing.

(5) If the gear lever is being removed to renew the dust boot or the 'O' ring, knock off the gear lever knob from the gear lever and discard the gear lever knob.

(6) Remove the dust boot and the 'O' ring from the gear lever.



View of gear selector lever and components removed from the vehicle.

TO CLEAN AND INSPECT

(1) Wash all the components in cleaning solvent and blow dry.

(2) Check the gear lever pivot ball and pivot ball seat for wear and damage.

(3) Check the reverse gear lockout ring for ease of movement.

(4) Check the gear lever selector finger for wear or damage.

(5) Check the gear lever 'O' ring groove for burrs or damage.

(6) Check the gear lever dust boot for damage or deterioration.

(7) Repair or renew any faulty components.

TO INSTAL

Installation is a reversal of the removal procedure with attention to the following points:

(1) Instal a new 'O' ring to the gear lever.

(2) Instal the gear lever dust boot to the gear lever.

NOTE: A soap and water solution applied to the reverse gear lockout ring will allow the dust boot to slide onto the gear lever more easily.

(3) Place a new gear level knob into a vessel with very hot water, but not boiling, for a few minutes.

(4) Instal the gear lever knob onto the gear lever, aligning the top of the shift pattern on the knob with the hole in the reverse gear lockout ring. Using a soft faced hammer and placing a protective piece of rag over the knob, tap the knob onto the gear lever.

(5) Lubricate the gear lever pivot ball, the pivot ball seat and the gear selector finger with molybdenum disulphide grease.

(6) Instal the gear lever into the gear lever housing and instal the gear lever retaining snap ring.

(7) Pull down the gear lever dust boot and instal the dust boot to the gear lever housing ensuring that the dust boot locating tag fits into the recess in the gear lever housing.

(8) Instal the gear lever surround to the centre console.

6. GEAR SELECTOR CONTROL ROD ASSEMBLY

TO REMOVE

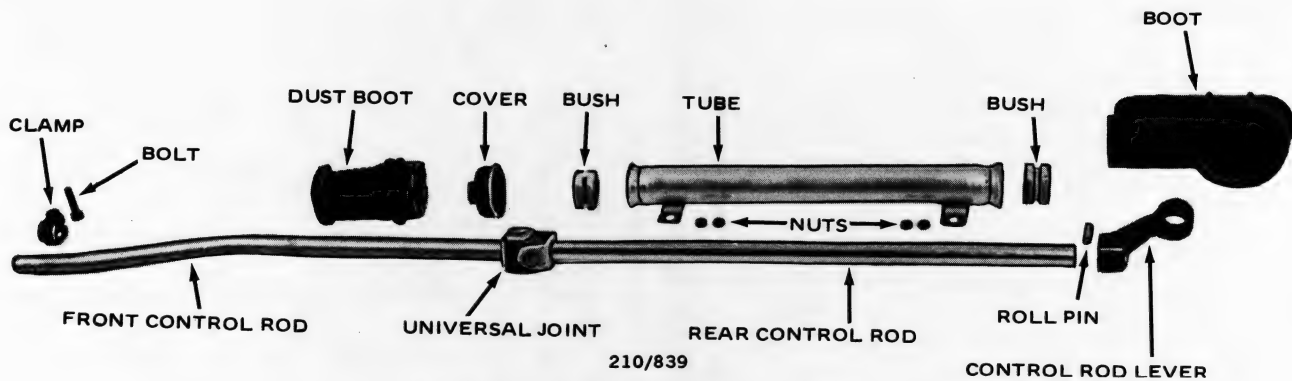
(1) Raise the front of the vehicle and support on chassis stands as described in the Wheels and Tyres section.

(2) Loosen the bolt on the clamp retaining the front control rod to the transaxle selector rod.

(3) Prise the rubber dust boot from the underfloor flange beneath the gear lever.

(4) Remove the nuts retaining the control rod assembly to the vehicle floor.

(5) Lower the rear end of the control rod assembly



Dismantled view of selector control rods and components.

to disengage the control rod lever socket from the gear lever finger.

(6) Withdraw the control rod assembly from the vehicle in a rearwards direction at the same time disconnecting the front control rod from the transaxle selector rod.

TO DISMANTLE

(1) Remove the dust boot from the rear of the control rod tube.

(2) Remove the dust boot from the front of the control rod tube and the front control rod.

(3) Place the rear control rod in a vice fitted with soft jaws.

(4) Using a suitable pin punch remove the pin retaining the control rod lever to the rear control rod.

(5) Prior to removing the control rod lever from the rear control rod mark the installed position of the control rod lever in relation to the control rod.

(6) Using a suitable drift drive out the control rod from the control rod lever.

(7) Withdraw the control rod from the control rod tube.

(8) Remove the front and rear bushes from the control rod tube using a suitable long drift.

(9) If the universal joint connecting the front and rear control rods needs renewing, grind the heads off the universal joint retaining rivets and remove the rivets from the universal joint. Mark the relationship between the front control rod fork and the rear control rod fork.

TO CLEAN AND INSPECT

(1) Wash the components in cleaning solvent and blow dry.

(2) Check the control rod tube for damage.

(3) Check the rubber dust boots for damage and deterioration.

(4) Check the control rod bushes for wear and damage.

(5) Check the control rods for wear, damage and straightness.

(6) Repair or renew any faulty components.

TO ASSEMBLE

Assembly is a reversal of the dismantling procedure with attention to the following points:

(1) Lubricate the universal joint replacement pins with a silicone based grease and assemble the universal joint. Secure the replacement pins with the retaining clips supplied. Ensure the front and rear control rod forks are facing each other as marked prior to dismantling.

(2) Apply a small amount of silicone based grease into the control rod bushes inner grooves.

(3) Instal the control rod bushes to the front and rear of the control rod tube using a tubular drift or socket.

(4) Instal the rear control rod into the control rod tube, instal the control rod lever onto the rear control rod as marked prior to removal and secure the control rod lever with a new retaining pin.

(5) Instal the dust boot to the rear of the control rod tube and the dust boot to the front of the control rod tube ensuring that the flanges of the control rod tube are correctly engaged into the grooves of the dust boots.

TO INSTAL

Installation is a reversal of the removal procedure with attention to the following points.

(1) Lubricate the selector lever socket with molybdenum disulphide grease.

(2) Ensure the surface around the floor flange is clean and dry.

(3) Ensure the gear lever is correctly engaged with the control rod lever socket.

(4) Instal the dust boot to the floor flange without any lubricant and ensure that the rib at the rear of the dust boot is aligned with the centre punch mark in the floor panel.

(5) Adjust the gear selector control rod as described under the following heading.

TO ADJUST

(1) Place the transaxle in the neutral position.

(2) Remove the plastic plug from the rear of the transaxle gear selector cover. Discard the plastic plug.

(3) Loosen the nut on the control rod clamp bolt

so the transaxle selector rod can be rotated independently from the control rod.

(4) Insert a 4 mm diameter rod or pin punch into the hole in the gear selector cover and push the rod against the intermediate selector lever.

(5) Slowly rotate the selector rod anti-clockwise, the rod will become engaged with the hole in the intermediate selector lever and when the selector rod is rotated further the rod will lock-up. Hold the selector rod in this position.

(6) Have a second operator hold the gear lever inside the vehicle in neutral position and in the first and second gear plane.

(7) Tighten the nut on the control rod clamp bolt and withdraw the rod from the selector cover. Check all gears for ease of operation.

(8) Instal a new plastic plug into the selector cover.

7. DRIVE SHAFTS

TO REMOVE

(1) Raise the front of the vehicle and support on chassis stands as described in the Wheels and Tyres section.

(2) Mark the installed position of the road wheel in relation to the front hub and remove the road wheel.

(3) Take out and discard the split pin retaining the front hub nut.

(4) Remove the drive shaft to front hub retaining nut.

(5) Disconnect the suspension control arm ball joint from the steering knuckle. Refer to the Front Suspension section if necessary.

(6) Loosen the front suspension strut upper mounting nuts a few turns. Do not remove the nuts.

(7) Pull the front hub and steering knuckle off the drive shaft.

NOTE: It may be necessary to tap the outer end of the drive shaft with a soft faced hammer to disengage the splines. Do this with care so as not to damage the thread on the drive shaft.

(8) With the aid of two flat levers placed behind the inner C.V. joint, lever the C.V. joint away from the transaxle case.

NOTE: If difficulty is experienced in withdrawing the drive shaft using the above mentioned method, particularly on automatic transaxle models, a suitable wedge shaped tool may be used between the inner C.V. joint and the transaxle case and tapping the tool with a hammer. Take care however not to damage the drive shaft oil seal in the transaxle case.

(9) Suitably plug the recess in the transaxle case to prevent loss of oil.

(10) Remove the drive shaft assembly from the vehicle.

NOTE: Ensure that the C.V. joints are not bent beyond their normal operating angles as damage to the C.V. joints and the dust boots could result. Never let one end of the drive shaft hang free unsupported.

TO DISMANTLE

(1) Place the drive shaft in a vice fitted with soft jaws.

(2) Remove and discard both the C.V. joint boot retaining clips. Slide the boot away from the C.V. joint towards the centre of the drive shaft.

NOTE: If both the C.V. joint boots and/or the C.V. joints needs renewing it is recommended they are removed and installed one at a time.

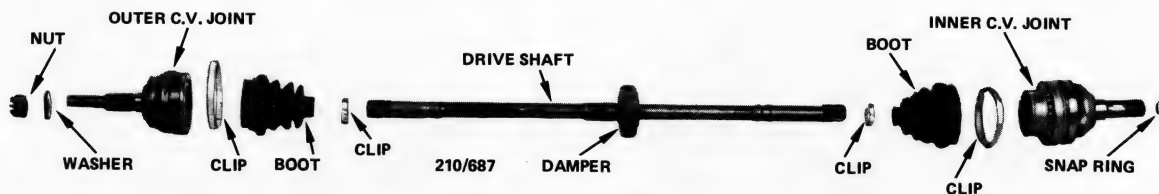
(3) Mark the installed position of the C.V. joint in relation to the drive shaft.

(4) Using a suitable snap ring pliers open up the snap ring retaining the C.V. joint to the drive shaft and at the same time tap the C.V. joint off the drive shaft using a soft faced hammer.

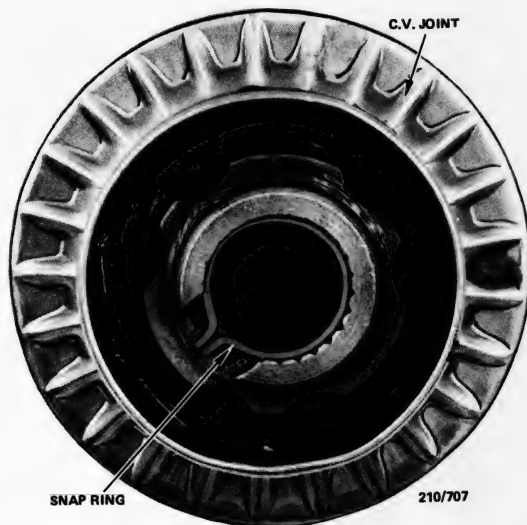
(5) Remove the C.V. joint boot from the drive shaft.

NOTE: No further dismantling of the C.V. joint is possible. If after cleaning and inspection the C.V. joint shows to be worn or damaged the C.V. joint will need to be renewed as a unit.

(6) Where applicable, mark the position of the dynamic damper in relation to the driveshaft.



Dismantled view of the right hand side drive shaft and components. A vibration damper is fitted to the right hand side drive shaft on manual transaxle only.



View of inner C.V. joint removed from drive shaft showing C.V. joint retaining snap ring.

(7) Remove the dynamic damper clamp bolts and remove the dynamic damper from the drive shaft.

TO CLEAN AND INSPECT

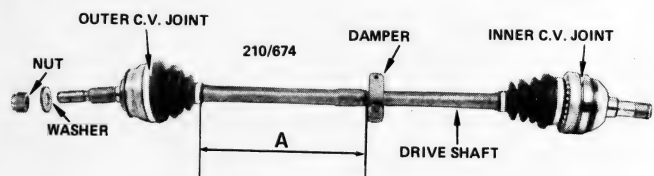
- (1) Remove as much grease as possible from the C.V. joint.
- (2) Wash all components in a suitable cleaning solvent and blow dry with compressed air.
- (3) Inspect the ball contact faces on the inner race and outer housing for pitting and wear.
- (4) Inspect the ball cage and balls for wear and damage.
- (5) Check the splines on the drive shaft and on the C.V. joint inner race for wear, twist or damage.
- (6) Check the dust boot for damage and deterioration.
- (7) Renew any component that is worn or damaged as necessary.

NOTE: Four different types of C.V. joints are used on the manual and on the automatic trans-axes. Sliding type C.V. joints are fitted on the inner end of the drive shafts and non sliding types on the outer end. The right hand side inner C.V. joint on automatic transaxle models has a male spline to engage with the differential side gear whilst the left hand side inner C.V. joint has a female spline to engage with the differential stub shaft, it is therefore important to state which side C.V. joint on which transaxle type is being renewed when ordering replacement parts.

TO ASSEMBLE

Assembly is a reversal of the dismantling procedure with attention to the following points.

- (1) Instal the C.V. joint dust boot, small end first, onto the drive shaft and slide it towards the centre of the shaft.
- (2) Thoroughly pack the C.V. joint housing and ball case with molybdenum disulphide grease.
- (3) Using suitable snap ring pliers expand the C.V. joint snap ring, instal the C.V. joint to the drive shaft and with the use of a soft faced hammer tap the C.V. joint onto the drive shaft until the snap ring snaps into its locating groove.
- (4) Clean off any excess grease from the outside of the C.V. joint housing.
- (5) Slide the large end of the C.V. joint dust boot over the C.V. joint housing. Ensure the ends of the dust boot are correctly positioned in the drive shaft groove and in the C.V. joint groove respectively. Expel all the air from inside the dust boot.
- (6) Secure both ends of the dust boot with new retaining clips ensuring that the clip tabs are pressed against the boot opposite the direction of rotation.
- (7) Where applicable, instal the dynamic damper to its marked position on the drive shaft, if no markings are available, measure a distance of 260 mm from the small end of the outer C.V. joint dust boot towards the centre of the drive shaft. Position the dynamic damper outer face at the end of this distance and secure the dynamic damper to the drive shaft with the retaining bolts.



Assembled view of right hand side drive shaft assembly.
Dimension A = 260 mm.

TO INSTAL

Installation is a reversal of the removal procedure with attention to the following points:

- (1) Remove the plug from the transaxle recess and instal the inner end of the drive shaft assembly into the transaxle in a horizontal line ensuring not to damage the driveshaft oil seal.
- (2) Using a suitable soft drift drive the inner C.V. joint into the transaxle until the C.V. joint retaining snap ring snaps into its groove.

NOTE: To check if the snap ring is correctly engaged with its locating groove pull the drive shaft outwards by hand.

- (3) Apply a small amount of transaxle oil to the outer C.V. joint splines and instal the outer C.V. joint into the front hub taking care not to damage the front hub seal.
- (4) Using the old drive shaft retaining nut and

washer pull the drive shaft through the front wheel hub.

(5) Instal the front suspension control arm ball joint to the steering knuckle. Instal and tighten the ball joint retaining nut securely and retain the nut with a new split pin.

(6) Remove the old drive shaft retaining nut and instal a new nut. Using a suitable tool to hold the front hub to prevent it from rotating tighten the drive shaft retaining nut as described in the Front Suspension section.

(7) Instal a new split pin to retain the drive shaft nut.

(8) Tighten the suspension unit upper mounting nuts to 20 Nm.

(9) Instal the front road wheel to the front hub aligning the mating marks made prior to removal.

(10) Lower the vehicle to the ground and check the transaxle oil level, top up with the recommended grade of transaxle oil if necessary.

Refer to supplement at back of manual for further information.

AUTOMATIC TRANSAXLE

SPECIFICATIONS

Type	Turbo Hydra-Matic 125
Code	EL
Operation	Automatic, hydraulic with chain drive between torque converter and gears
Gear ratios:	
Low (L)	2.84:1
Intermediate (S)	1.60:1
Drive (D)	1.00:1
Reverse (R)	2.07:1

TORQUE WRENCH SETTINGS

Torque converter to drive plate bolts	70 Nm
Oil pan bolts	16 Nm
Converter housing to engine bolts	90 Nm
Converter housing inspection cover bolts	12 Nm

1. AUTOMATIC TRANSAXLE TROUBLE SHOOTING

NOTE: The following transaxle faults can be caused by conditions that may be rectified within the scope of the information given in this section.

NO DRIVE IN D RANGE

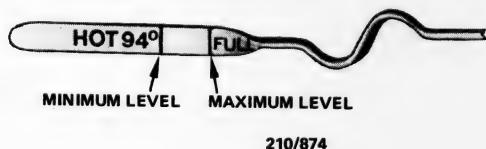
- (1) Low fluid level in transaxle: Check fluid level in transaxle and top up if necessary.
- (2) Incorrectly adjusted selector cable: Check and adjust selector cable as detailed.
- (3) Incorrect or contaminated transaxle fluid: Drain and refill with recommended grade and quantity of transaxle fluid.

NO REVERSE DRIVE IN R RANGE

- (1) Low fluid level in transaxle: Check fluid level in transaxle and top up if necessary.
- (2) Incorrectly adjusted selector cable: Check and adjust selector cable as detailed.
- (3) Incorrect or contaminated transaxle fluid: Drain and refill with recommended grade and quantity of transaxle fluid.

SLIPPING OR ROUGH ON UPSHIFT

- (1) Low fluid level in transaxle: Check fluid level in transaxle and top up if necessary.



Check the transaxle fluid level and top up as necessary.

- (2) Incorrectly adjusted selector cable: Check and adjust selector cable as detailed.

- (3) Incorrectly adjusted kickdown cable: Check and adjust kickdown cable as detailed.

- (4) Binding or disconnected kickdown cable: Check and connect or renew kickdown cable as detailed under the appropriate heading.

NO TRANSAXLE KICKDOWN

- (1) Incorrectly adjusted kickdown cable: Check and adjust kickdown cable as detailed.

- (2) Binding or disconnected kickdown cable: Check and connect or renew kickdown cable as detailed.

- (3) Incorrectly adjusted throttle cable or linkage: Check and adjust throttle cable as detailed in the Fuel System section.

NOTE: Check and adjust the throttle cable and linkage before adjusting the kickdown cable.

STARTER MOTOR WILL NOT OPERATE IN N OR P POSITIONS OR WILL OPERATE IN ANY RANGE

- (1) Neutral safety switch faulty: Renew neutral safety switch.

- (2) Incorrectly adjusted selector cable: Check and adjust selector cable as detailed under the appropriate heading.

2. DESCRIPTION

The automatic transaxle combines a fluid coupling or torque converter with a fully automatic three speed epicyclic gear system.

The transaxle provides three forward ratios and one reverse. Drive is transmitted from the torque converter to the gears via drive sprockets and a drive chain.

The final drive gear train or differential and the transmission use a common lubricant. The transaxle oil pan has to be removed to drain the transaxle. Topping up or refilling is done through the filler tube which also accommodates the dipstick.

Cooling of the transaxle fluid is achieved by circulating the fluid, via a feed pipe and return pipe, through an oil cooler situated in the radiator left hand side tank.

The gear selector lever is floor mounted and connected to the transaxle by an adjustable control cable. The selector quadrant adjacent to the base of the lever is marked L, S, D, N, R, P.

It is necessary for the selector lever to be in the N or P position before the engine can be started. Never select P when the vehicle is in motion or R when the vehicle is in forward motion as damage to the transaxle will result.

When testing or tuning the engine the handbrake must be firmly applied and the selector lever must be in

the P position, otherwise the vehicle could move forward or backward as the engine speed is increased.

For long distance towing the vehicle should be towed with the front of the vehicle raised. The vehicle may be flat towed with the selector in N for distances less than 60 km and at a speed not above 50 km/h if the cause for which the vehicle is being towed is not within the transaxle assembly. Tow the vehicle in a forward direction only.

It is not possible to start the engine by either pushing or towing the vehicle.

The transaxle can be removed from the vehicle without engine removal.

NOTE: As extensive knowledge and equipment is required to overhaul the automatic transaxle assembly it is therefore not a worthwhile repair proposition for the average person. However if the transaxle must be removed for overhaul by a specialist, or if it is to be replaced by a exchange unit, the removal and installation procedure is described at the end of this section.

3. TRANSAXLE FLUID

Only the recommended automatic transaxle fluid should be used in the transaxle when topping up or changing the fluid in the transaxle. See Specifications in the Lubrication and Maintenance section.

The fluid level in the transaxle should be checked at regular intervals of not greater than 10,000 km or 6 months. The transaxle fluid should normally be drained and the transaxle refilled, as a normal service operation, every 40,000 km or 24 months. However if the vehicle is operating under severe or dusty conditions this interval should be halved. During this operation the fluid filter should also be renewed.

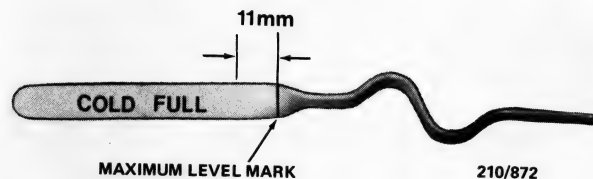
The fluid should be drained when the transaxle assembly is cold as most of the fluid has then drained itself into the transaxle oil pan.

TO CHECK AND TOP UP

- (1) Place the vehicle on a level floor, firmly apply the handbrake and select P (Park) and leave in that position.

NOTE: When working on the automatic transaxle, cleanliness is an absolute must. Do not reuse transaxle fluid and do not allow foreign matter to enter the filler tube opening.

- (2) Open the engine bonnet and clean around the top of the transaxle filler tube and dipstick to ensure that no foreign matter can enter the filler tube as the dipstick is withdrawn.
- (3) Start the engine and let it run at normal idle speed.
- (4) Withdraw the dipstick from the filler tube,



Transaxle fluid dipstick. When the transaxle is cold the fluid level should be below but within 11 mm of the maximum level mark.

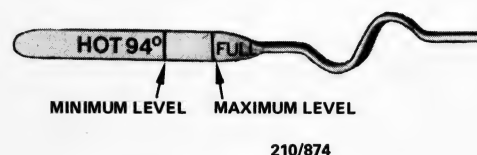
wipe it clean with a clean cloth and fully insert the dipstick into the filler tube then again withdraw the dipstick.

- (5) Check the fluid level on the dipstick taking the following into consideration.

- (a) If the transaxle is cold, take a reading on the side of the dipstick which is marked COLD/FULL. The fluid level should be between the maximum mark and a line not further below the mark than 11 mm.

- (b) If the transaxle is at normal operating temperature take a reading on the side of the dipstick which is marked 94°C. The fluid level should be between the maximum and the minimum marks.

- (6) If necessary add sufficient fluid of the recommended grade (see Lubrication and Maintenance section) through the filler tube to the required level.

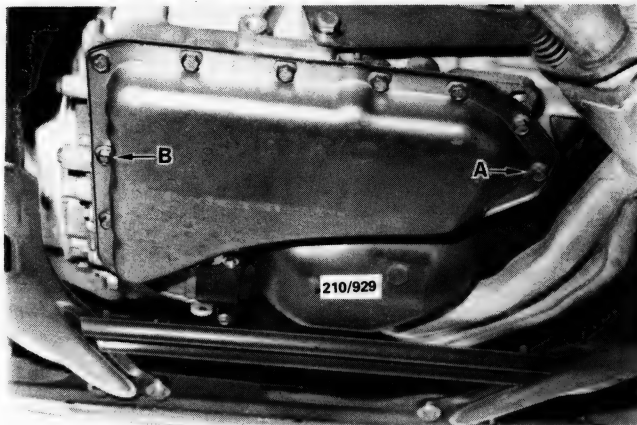


Transaxle fluid dipstick. With the transaxle at operating temperature the fluid level should be between the minimum and maximum level marks.

NOTE: Do not overfill the transaxle or foaming and unsatisfactory operation of the transaxle will result. If it has been necessary to add a substantial amount of fluid to the transaxle the cause of fluid loss should be immediately investigated.

TO DRAIN AND REFILL

- (1) Raise the front of the vehicle and support on chassis stand as described in the Wheels and Tyres section.
- (2) Clean the bottom of the transaxle oil pan and the area around the oil pan and the transaxle case.
- (3) Place a suitable large drain tin under the transaxle oil pan.
- (4) Remove the transaxle oil pan retaining bolts except bolt 'A' at the front and bolt 'B' at the rear as shown in the illustration.
- (5) Loosen the two remaining bolts four complete turns.
- (6) Using a rubber mallet strike the corners of the oil pan beneath the centre of the torque converter housing in either direction until the oil pan seal breaks.



Installed view of the transaxle oil pan showing the two oil pan retaining bolts to be removed last when draining the transaxle fluid. See text.

NOTE: Do not use a screwdriver as a wedge to separate the oil pan from the transaxle case.

(7) Remove the oil pan rear retaining bolt (B) and slowly tilt the oil pan downwards and let the fluid drain from the oil pan into the drain tin.

(8) After most of the fluid has drained remove the oil pan front retaining bolt (A) and remove the oil pan and gasket from the transaxle case.

(9) Note the installed position of the oil filter assembly in relation to the dipstick stop plate.

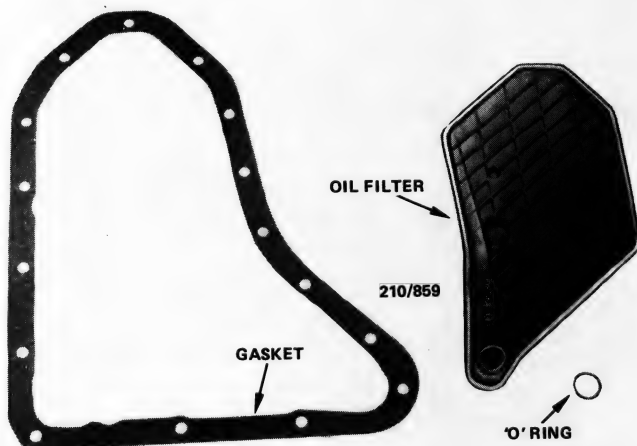
(10) Withdraw and discard the oil filter and the oil filter 'O' ring from the transaxle assembly.

(11) Thoroughly clean the oil pan and remove all traces of old sealing compound and gasket material from the oil pan and the transaxle case.

(12) Lubricate a new oil filter 'O' ring with clean transaxle fluid and instal the 'O' ring to a new oil filter.

(13) Instal the oil filter to the transaxle ensuring the oil filter is correctly located against the dipstick stop plate.

(14) Apply a suitable sealing compound to both sides of the oil pan gasket.



View of transaxle oil pan gasket, oil filter and oil filter 'O' ring.



View of transaxle oil pan removed from transaxle.

(15) Instal the oil pan and gasket to the transaxle case. Fit all the oil pan retaining bolts loosely before securely tightening the bolts to Specifications in a diagonal fashion.

(16) Lower the vehicle to the ground and ensure that the vehicle is level.

(17) Add 3.8 litres of the specified fluid to the transaxle and check and top up the transaxle fluid as previously described.

4. TRANSAXLE SELECTOR CABLE

TO ADJUST

- (1) Place the selector lever in the N position.
- (2) Remove the selector lever cover, which is a snap-on fit, from the centre console. Rotate the selector lever cover 90 degrees and remove the selector lever cover from the lever.
- (3) Unclip the selector lever opening flexible cover at the front and rear from the control cover and remove the flexible cover from the selector lever.
- (4) Remove the screws retaining the selector control cover to the centre console and remove the selector control cover from the centre console.
- (5) Place the selector lever in the P position.
- (6) Loosen the trunnion nut at the upper end of the intermediate lever to release the selector inner cable.
- (7) Push the selector inner cable fully forward and ascertain that the selector lever on the transaxle is in the P detent position.
- (8) Secure the trunnion nut at the upper end of the intermediate lever.
- (9) Check the operation of the selector lever in all ranges.
- (10) Instal the selector control cover to the centre console and the selector lever opening cover to the selector control cover.
- (11) Place the selector lever in the N position and



View of selector cable adjusting point support bracket.

check that the arrow on the selector lever opening cover aligns with the N on the indicator. If adjustment is necessary lift the front of the indicator and slide the indicator forwards or rearwards as required.

(12) Instal the selector lever cover to the centre console.

TO REMOVE AND INSTAL

- (1) Remove the centre console as described in the Body section.
- (2) Place the selector lever in the N position.
- (3) Loosen the trunnion nut at the upper end of the intermediate lever to release the selector inner cable.
- (4) Move the selector lever to the P position to disengage the selector inner cable from the trunnion.
- (5) Remove the nut retaining the selector cable assembly to the support bracket.
- (6) Working inside the engine compartment remove the clip retaining the selector inner cable to the transaxle selector lever pin.
- (7) Loosen the nut retaining the selector cable assembly to the cable support bracket.
- (8) Disconnect the cable assembly from the support bracket and the inner cable from the transaxle selector lever pin.
- (9) Connect a suitable length of string or tie wire to the selector lever end of the selector cable.
- (10) Gently pull the selector cable assembly from under the floor carpet, through the bulkhead, into the engine compartment. When the string or wire starts to appear outside the bulkhead, disconnect the string or wire from the selector cable assembly and remove the selector cable from the vehicle.

Installation is a reversal of the removal procedure with attention to the following points:

- (1) Connect the string or wire to the selector lever end of the cable assembly and from the inside of the vehicle pull the cable through the bulkhead, under the floor carpet and towards the selector lever, into position. Disconnect the string or wire from the selector cable.
- (2) Guide the inner selector cable into the selector lever trunnion.

(3) Instal the cable grommet correctly into the bulkhead and around the cable.

(4) Instal the inner cable to the transaxle selector lever pin and secure with the retaining clip.

(5) Instal the outer cable ends to the selector lever bracket and to the transaxle bracket and secure the cable assembly with the retaining nuts. Ensure the cable dust cover is correctly installed to the end of the selector cable at the transaxle.

(6) Instal the centre console and adjust the selector cable as previously described.

(7) Instal the selector lever cover.

5. NEUTRAL SAFETY SWITCH

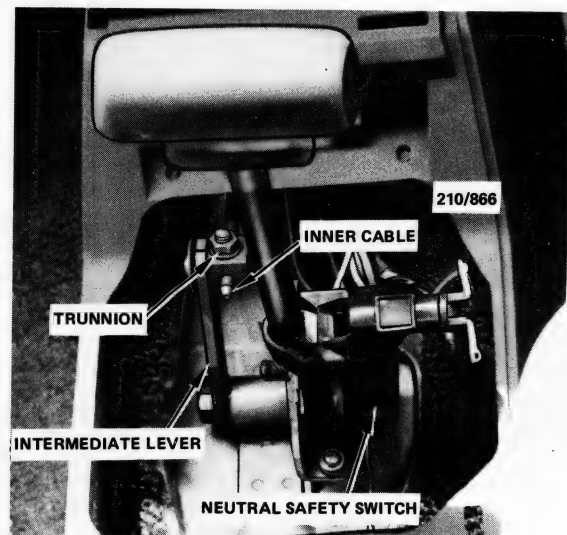
DESCRIPTION

The neutral safety switch is wired in series with the starter motor solenoid to ensure that the engine can be started only with the transaxle in the P or N positions. A reverse lamp switch is also incorporated in the switch body. The switch is mounted on the vehicle floor and is actuated by the gear selector lever.

The switch is not adjustable or repairable therefore if its operation is faulty it should be renewed.

TO TEST

- (1) Remove the centre console as described in the Body section.
- (2) Mark the installed position of the neutral safety switch loom wires in relation to the switch terminals. Disconnect the wires from the switch terminals.
- (3) Position the selector lever in the N position.
- (4) Select the two terminals on the switch from which the two violet colored wires were removed and connect ohmmeter probes to the terminals and test for continuity.



View of neutral safety switch location and selector control cable adjusting point.

- (5) Repeat the same test in the P position.

NOTE: There should be no continuity in the circuit if the selector lever is placed in L, S, D or R.

- (6) Perform the same test as above now using the terminals from which the pink and the light green colored wires were removed. Continuity should be present in the R position only.

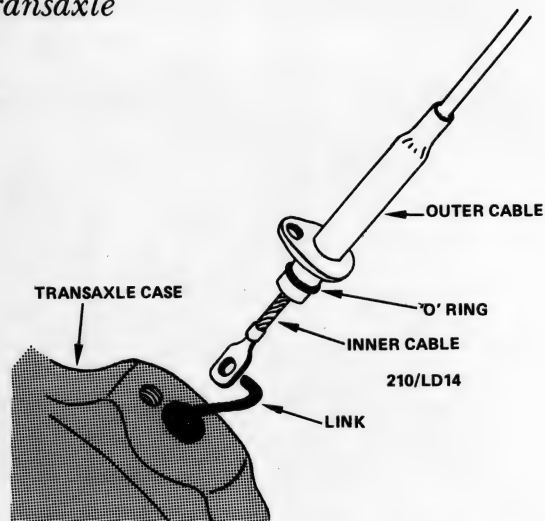
TO REMOVE AND INSTAL

- (1) Remove the centre console as described in the Body section.
 - (2) Remove the screws retaining the neutral safety switch to the floor.
 - (3) Mark or note the installed positions of the switch wires in relation to the switch terminals. Disconnect the wires from the switch terminals.
 - (4) Remove the switch from the terminals.
- Installation is a reversal of the removal procedure with attention to the following points:
- (1) Connect the wires to the switch terminals as marked prior to removal.
 - (2) Instal the switch to the floor ensuring that the switch actuating pin on the selector lever is correctly engaged in the lug on the switch.
 - (3) Check the operation of the switch before installing the centre console.

6. KICKDOWN CONTROL CABLE

TO REMOVE AND INSTAL

- (1) Disconnect the kickdown inner cable from the carburettor throttle linkage.
 - (2) Squeeze together the two lugs retaining the kickdown outer cable to the carburettor bracket.
 - (3) Release the straps retaining the kickdown cable to the engine assembly.
 - (4) Remove the bolt retaining the kickdown cable to the transaxle.
 - (5) Withdraw the kickdown cable from the transaxle sufficiently to disconnect the inner cable from the transaxle kickdown cable link.
 - (6) Remove the 'O' ring from the kickdown cable and discard the 'O' ring.
- Installation is a reversal of the removal procedure with attention to the following points.
- (1) Instal a new 'O' ring to the kickdown cable assembly and connect the inner cable to the transaxle kickdown cable link.
 - (2) Push the outer cable into the transaxle opening and secure the cable with the retaining bolt.
 - (3) Instal the other end of the cable assembly into the carburettor bracket and connect the inner cable to the carburettor throttle linkage.
 - (4) Adjust the cable to its correct position using the following procedure.



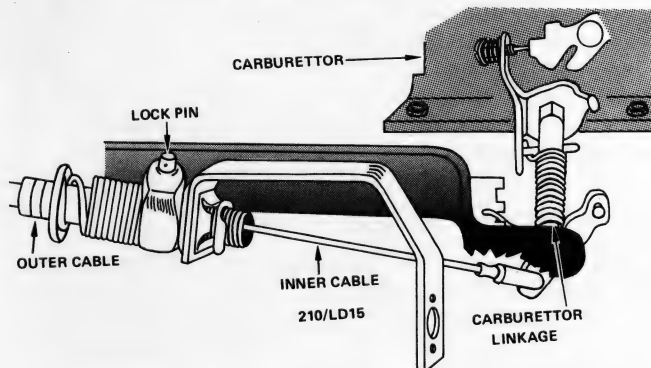
Line drawing showing method used to connect kickdown cable to the cable link on transaxle.

TO ADJUST

- (1) Disconnect the kickdown inner cable from the carburettor throttle linkage.
- (2) With the engine at normal operating temperature check and if necessary adjust the idling speed as described in the Tune-up section. Ensure that the carburettor choke valve is fully open.
- (3) With the engine switched off, depress the throttle pedal 90 per cent or more of its travel and check that wide open throttle is obtained. Release the throttle pedal.
- (4) Connect the kickdown inner cable to the carburettor throttle linkage.
- (5) Using a suitable piece of wire, feed the wire through the hole in the kickdown cable adjuster lock pin and lift up the lock pin.

NOTE: Do not use pliers to lift up the lock pin as damage to the lock pin will result.

- (6) With the lock pin in the lifted position, fully depress the throttle pedal and release the lock pin. The correct position of the kickdown cable will now be automatically adjusted.
- (7) Remove the wire from the lock pin.



Line drawing showing installed position of kickdown cable and cable adjusting lock pin.

7. TRANSAXLE ASSEMBLY

Special Equipment Required:

To Remove and Instal – Suitable trolley jack to which the transaxle can be secured

TO REMOVE

- (1) Raise the engine bonnet and fit fender covers to both front fenders.
- (2) Disconnect the battery negative terminal.
- (3) Remove the air cleaner assembly from the engine, if necessary refer to the Fuel System section for the correct procedure.
- (4) Remove the distributor cap and the rotor arm from the distributor.
- (5) Disconnect the kickdown cable from the transaxle as previously described.
- (6) Disconnect the selector control cable from the transaxle selector lever.
- (7) Remove the bolts retaining the selector cable support bracket to the transaxle and remove the bracket and cable from the transaxle.
- (8) Disconnect the speedometer cable from the transaxle governor housing.
- (9) Disconnect the transaxle fluid cooling hoses from the transaxle. Suitably plug the ends of the hoses and the hose unions on the transaxle to prevent entry of dirt and loss of fluid.
- (10) Loosen the front road wheels retaining bolts and mark the installed positions of the front road wheels in relation to the front hubs.
- (11) Raise the front of the vehicle and support on chassis stands as described in the Wheels and Tyres section.
- (12) Remove the front road wheels retaining bolts and remove the front road wheels from the front wheel hubs.
- (13) Support the engine on a suitable jack, using a block of wood between the engine sump and the jackhead to prevent damage to the engine sump.
- (14) Disconnect the fuel pump inlet hose at the fuel pump and suitably plug the fuel hose.
- (15) Remove the nuts retaining the left hand side rear engine mounting to the vehicle frame.
- (16) Remove the bolts retaining the torque reaction damper bracket to the torque reaction damper and to the transaxle. Remove the bracket from the vehicle.
- (17) Remove the three upper bolts retaining the torque converter housing to the engine.
- (18) Remove the bolt retaining the filler tube support bracket to the transaxle and remove the filler tube. Plug the filler tube opening in the transaxle to prevent loss of fluid and entry of dirt.
- (19) Disconnect the front suspension control arm ball joints from the suspension struts and the tie rod ends from the steering arms as described in the Front Suspension section.
- (20) Disconnect the stabiliser bar link from the left

hand side suspension control arm.

(21) Remove and discard the six bolts retaining the left hand suspension control arm and carrier assembly and withdraw the assembly from the vehicle.

(22) Withdraw both the drive shaft inner C.V. joints from the transaxle as described in the Manual Transaxle section.

(23) Remove the bolts retaining the torque converter inspection cover to the transaxle and remove the inspection cover.

(24) Suitably mark the installed position of the torque converter in relation to the drive plate to ensure correct assembly and remove the torque converter retaining bolts. Discard the retaining bolts.

(25) Remove the bolts retaining the exhaust pipe bracket to the transaxle and swing the bracket to one side out of the way.

(26) Disconnect the front exhaust pipe at the intermediate joint.

(27) Place a suitable trolley jack beneath the transaxle ensuring that the trolley jack does not damage the transaxle oil pan.

(28) Remove the bolts and nuts retaining the left hand side rear engine mounting bracket to the transaxle.

(29) Remove the bolts retaining the left hand side rear mounting stop to the vehicle frame.

(30) Lower the engine and transaxle assembly enough to remove the rear mounting and mounting bracket assembly.

(31) Remove the remaining torque converter housing to engine retaining bolts.

(32) Carefully withdraw the transaxle from the engine until it clears the locating dowels on the engine ensuring that the torque converter does not stay attached to the drive plate. It may be necessary to gently lever the transaxle and the engine apart with a screwdriver between the two assemblies in the area of the locating dowels.

(33) When the transaxle is clear of the locating dowels, attach a suitable retaining strap to the converter housing. Bolt the strap to the housing so that the strap retains the converter in position when the transaxle is completely withdrawn from the engine assembly.

(34) Lower the trolley jack supporting the transaxle assembly and withdraw it from beneath the vehicle.

TO INSTAL

Installation is a reversal of the removal procedure with attention to the following points:

- (1) Ensure that the torque converter is fully engaged in the front of the transaxle.
- (2) Ensure that the faces of the converter housing and the rear of the engine are clean and free of burrs.
- (3) Ensure the marks on the drive plate and on the torque converter made prior to removal are aligned. The torque converter retaining bolts must be renewed.
- (4) Align the torque reaction damper and tighten the engine mountings and brackets in the correct sequence as outlined in the Engine section.

(5) Ensure that the snap rings on the inner C.V. joints are fully engaged in their mating grooves in the transaxle.

(6) Use new micro-encapsulated retaining bolts when installing the suspension control arm and carrier assembly to the vehicle.

(7) Refill or top up the transaxle with the specified grade of transaxle fluid.

(8) Check and if necessary adjust the selector control cable and the kickdown cable as previously described.

(9) Bring the engine and transaxle to operating temperature, check the transaxle fluid level and check for fluid leaks.

(10) Road test the vehicle.

8. DRIVE SHAFTS

Only the construction of the automatic transaxle driveshafts C.V. joints is different to a small degree to the construction of the manual transaxle drive shaft C.V. joints.

The removal, dismantling and assembling procedure for the automatic transaxle drive shaft assemblies is identical to that which is fully outlined for the manual transaxle drive shaft assemblies in the Manual Transaxle section. However take into consideration that no vibration damper is employed on the driveshafts and a suitable wedge shaped tool is needed to withdraw the drive shaft inner C.V. joint from the transaxle.

SPECIFICATIONS

Steering gear type Variable ratio rack and pinion
Steering column type Energy absorbing
Linkage Direct from rack to tie rods and steering arms

Ratios:

On centre 22:1
On lock 26:1
Turns lock to lock 4.67
Rack pad adjustment 6 Nm then back off 18 to 21 degrees
Steering gear preload 2 Nm

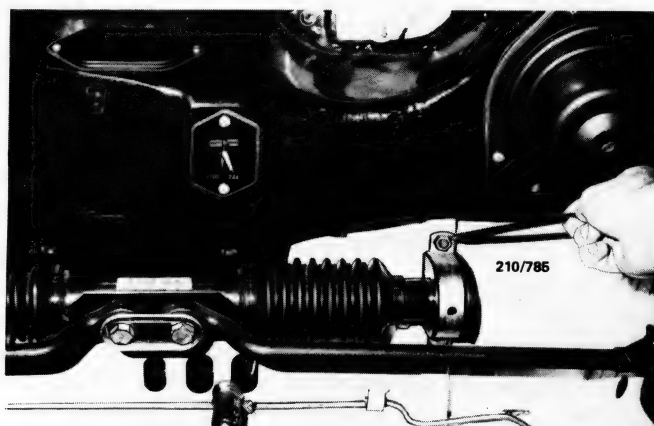
TORQUE WRENCH SETTINGS

Steering wheel nut 22 Nm
Tie rod to rack bolts 82 Nm
Steering gear mounting nuts 20 Nm
Pinion bearing retaining screw 60 Nm
Rack pad locknut 65 Nm

1. STEERING TROUBLE SHOOTING

EXCESSIVE PLAY OR LOOSENESS IN STEERING GEAR

- (1) Tie rod end loose or worn: Tighten or renew worn tie rod end.
- (2) Steering gear assembly loose on crossmember: Inspect for damage and tighten steering gear mounting bolts.
- (3) Steering rack and pinion worn: Overhaul steering gear.
- (4) Worn or loose steering flexible coupling: Inspect, tighten or renew worn flexible coupling.
- (5) Tie rod rubber bushes loose or worn: Tighten or renew worn bushes.
- (6) Steering wheel loose on shaft: Check for damaged or worn splines, torque steering wheel nut to Specifications.



Check the steering gear mountings for looseness.

NOTE: Looseness in the steering linkage is best assessed with the weight of the vehicle on the front wheels. Have an assistant turn the steering wheel backward and forward while the inspection for wear is being made. If looseness is found to be in the rack and pinion assembly then it will be necessary to overhaul the rack and pinion.

HEAVY STEERING

- (1) Low or uneven tyre pressures: Check tyres and inflate to recommended pressures.
- (2) Suspension worn or out of alignment: Check front suspension for wear, renew worn components and realign.
- (3) Misalignment of steering column or steering flexible coupling: Check and align steering column and steering coupling.
- (4) Insufficient lubricant in steering gear: Check for lubricant leak and repair as necessary.
- (5) Steering gear incorrectly adjusted: Remove steering gear and adjust.

NOTE: Ensure that the both front tyres have ample depth of tread and are inflated to the correct pressures. Check the front suspension components for wear before having the steering geometry checked. See Front Suspension section for component checking procedure.



Check the steering gear dust boots for deterioration.

STEERING PULLS TO ONE SIDE

- (1) Uneven tyre wear or pressures: Check condition of tyres and inflate to recommended pressures.
- (2) Front suspension worn or out of alignment: Check suspension for wear, renew worn components and align.
- (3) Binding brakes: Check brakes.
- (4) Rear suspension worn or out of alignment: Check suspension for wear and renew worn components.

NOTE: If tyre condition and front and rear wheel alignment have been checked out and found to be OK, raise the front and rear of the vehicle and spin the wheels to check for the brakes binding.

FRONT WHEEL WOBBLE OR SHIMMY

- (1) Tyre or wheel unbalance: Check and balance as necessary.
- (2) Loose or worn front hub bearings: Replace front hub bearings.
- (3) Faulty suspension units: Check and renew suspension units, preferably in pairs.
- (4) Loose or worn tie rod ends: Check and tighten or renew faulty components.
- (5) Looseness in steering gear: Adjust or overhaul the steering gear.

NOTE: Check the steering linkage as previously described and check the front suspension for wear as outlined in the Front Suspension section. Wheel wobble or shimmy is normally caused by unbalance of the tyres and/or wheels, providing the front suspension and steering are in a serviceable condition.



Push and pull the front road wheels at the top and bottom to check for excessive looseness in the suspension ball joints and hub bearings.

STEERING ERRATIC OR WANDERING

- (1) Front suspension worn or out of alignment: Check suspension for wear, renew worn components and align.
- (2) Smooth front tyres: Check and renew tyres as necessary.
- (3) Excessive play in steering gear or linkage: Check and renew or adjust faulty components.
- (4) Excessively high or low tyre pressures: Check and inflate to the recommended pressures.

NOTE: Check the steering linkage as previously described and check the front suspension for wear as outlined in the Front Suspension section.

RATTLE IN STEERING GEAR

- (1) Steering gear incorrectly adjusted: Remove steering gear and adjust.



Check the tie rod ends for wear or looseness.

- (2) Loose or worn steering shaft bearings: Replace bearings as necessary.
- (3) Wear in tie rod bushes: Renew worn tie rod bushes.
- (4) Insufficient lubricant in steering gear: Check for lubricant leak and repair as necessary.

2. DESCRIPTION

The steering gear is a variable ratio rack and pinion type and is secured to the bulkhead with clamps and rubber mountings.

The steering rack is positioned in the steering gear housing by a sliding bush mounted at one end of the rack and the pinion and rack pad adjuster at the other end.

The pinion shaft is supported by a roller bearing at its upper end and a needler roller bearing at the lower end. The needle roller bearing is pressed into the steering gear housing and is not replaceable.

The pinion shaft is mounted to a flexible coupling which in turn is connected to the steering column shaft.

The tie rods are connected at one end to the rack by bolts passing through rubber bushes and to the steering arms by sealed tie rod ends at the other end.

The assembly is protected against the entry of water and dust by a seal on the pinion shaft and by corrugated boots fastened by clips to the steering gear housing and the centre cover.

The steering column is a collapsible type designed to absorb secondary impact in the event of a severe front end collision.

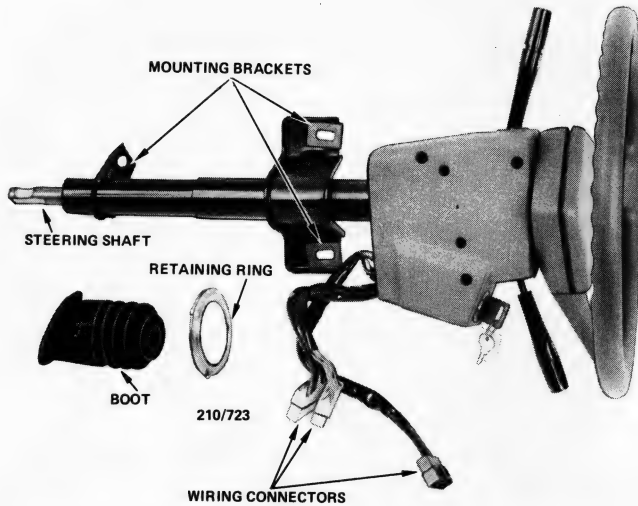
3. STEERING COLUMN ASSEMBLY

Special Equipment Required:

To Remove Steering Wheel – Suitable steering wheel puller

TO REMOVE AND INSTAL

- (1) Disconnect the negative battery terminal.
- (2) Check that the steering is in the straight ahead position.



Steering column assembly removed from vehicle.

- (3) Working inside the vehicle, remove the lower trim panel from above the brake pedal.
- (4) Remove the screws retaining the centre lower steering column cover, disconnect the ducting and remove the lower cover from the dash.
- (5) Remove the bolts securing the steering column boot retaining ring to the bulkhead.
- (6) Slide the retaining ring and boot back to gain access to the steering flexible coupling.
- (7) Remove the flexible coupling upper pinch bolt.
- (8) Disconnect the combination and ignition switch wiring connectors.
- (9) Remove the lower column mounting bolt at the left hand side of the steering column.
- (10) Support the steering column and remove the two bolts securing the upper column to the dash panel.
- (11) Slide the steering column rearward clear of the flexible coupling and remove the column from the vehicle.

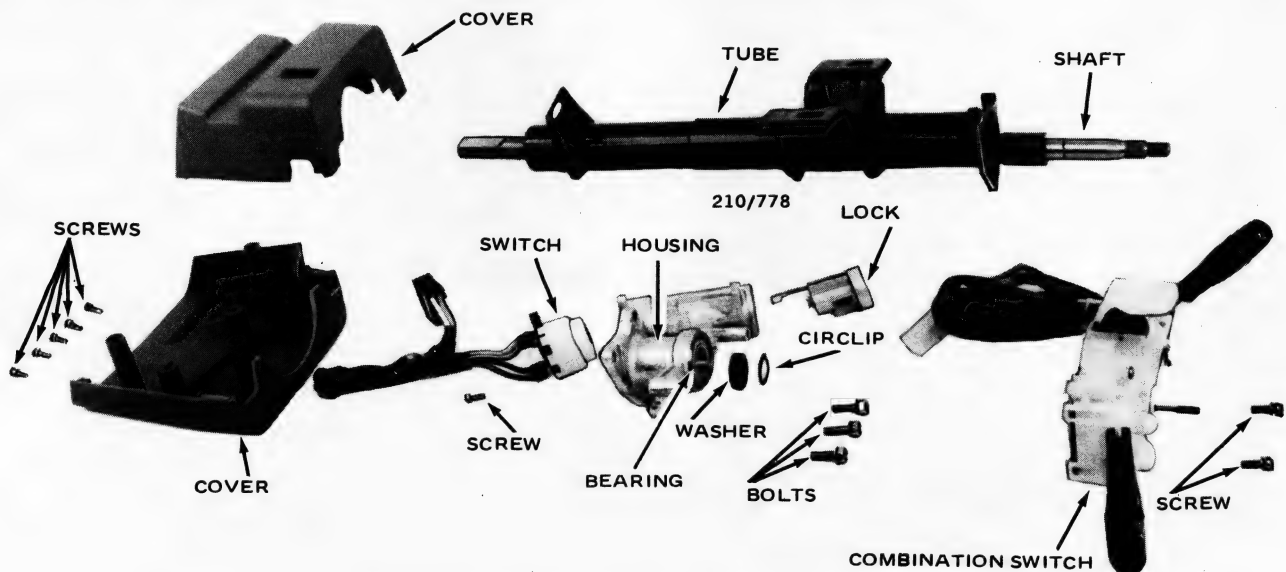
Installation is a reversal of the removal procedure with attention to the following points:

- (1) Ensure that the steering gear has not moved and is still in the straight ahead position.
- (2) Align the groove in the steering shaft with the pinch bolt hole in the coupling and fit the steering column assembly to the vehicle. Loosely install the coupling pinch bolt and the upper and lower column mounting bolts.
- (3) Securely tighten the lower column mounting bolt, the upper column mounting bolts and the steering gear coupling pinch bolt in that order.
- (4) Fit the steering column rubber boot and retaining ring and tighten the retaining bolts securely. Ensure that the upper end of the boot is fitted as high as possible over the column assembly.
- (5) Connect the combination and ignition switch wiring connectors and install the ducting, the lower steering column cover and the lower trim panel.
- (6) Connect the negative battery terminal.

TO DISMANTLE

- (1) Remove the steering column as previously described. Mount the steering column in a suitable soft jawed vice.
- (2) Insert a screwdriver in the slot at the top of the horn pad to release the retaining clip and lift off the horn pad.
- (3) Remove the steering wheel retaining nut and washer and mark the steering wheel in relation to the steering shaft to aid assembly. Use a suitable puller to remove the steering wheel.

NOTE: It is imperative that a puller be used to remove the steering wheel as a sharp blow can cause damage to the steering column energy absorbing components.



Dismantled view of steering column components.

(4) Remove the steering column cover retaining screws and remove the covers from the steering column.

(5) Remove the screws securing the combination switch assembly to the upper bearing support housing and slide the combination switch from the steering column.

(6) Remove the upper bearing circlip and washer and turn the ignition key to the 'OFF' position to release the steering lock pawl.

(7) Remove the upper bearing support housing retaining bolts. Slide the housing and bearing from the steering shaft. If the bearing is a tight fit on the steering shaft use a suitable puller to remove the housing assembly. Do not try to remove the housing by hammering the steering shaft as this could damage the energy absorbing components of the shaft.

TO CHECK AND INSPECT

If the vehicle has been involved in a collision and damage is apparent to the steering column then the steering column assembly must be renewed as it is not repairable.

If the lower steering column bearing is suspected of being faulty then the column assembly must also be renewed.

The upper steering column bearing can be replaced but only as an assembly with the bearing support housing.

(1) Check the steering column bearings for wear or roughness.

(2) Check the outer steering column tube for damage.

(3) Check the threaded and the splined sections of the steering shaft for damage.

(4) Check the steering shaft for signs of collapse and for movement between the inner and outer shafts.

(5) Check the steering wheel hub for damaged splines.

(6) Check the upper bearing support housing for wear or damage.

(7) Renew all unserviceable or suspect components.

TO ASSEMBLE

Assembly is a reversal of the dismantling procedure with attention to the following points:

(1) Instal the upper bearing support housing to the steering shaft and fit the retaining circlip and washer. Instal and tighten the upper bearing support housing retaining bolts.

(2) Instal the combination switch assembly to the upper bearing support housing and tighten the retaining screws.

(3) Fit the upper and lower steering column covers.

(4) Align the marks made on removal and fit the steering wheel to the steering shaft. Ensure that the turn signal drive pins are correctly aligned with the holes in the steering wheel boss. Instal the washer and retaining nut and torque the nut to Specifications.

(5) Fit the horn pad to the steering wheel by installing the lower side of the pad onto its retaining clip and then pressing the top of the pad onto the steering wheel, until the upper clip locks in position.

4. FLEXIBLE COUPLING

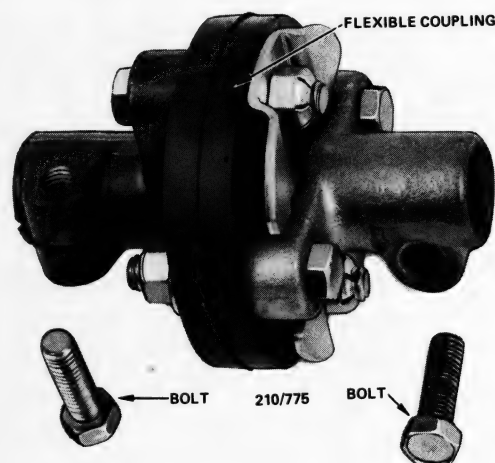
TO REMOVE AND INSTAL

(1) Remove the steering column from the vehicle as previously described.

(2) Remove the pinch bolt securing the flexible coupling to the steering gear pinion shaft.

(3) Slide the flexible coupling off the pinion shaft and remove it from the vehicle.

(4) Inspect the flexible coupling for wear or deterioration and replace as necessary.



View of flexible coupling.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Align the groove in the pinion shaft with the pinch bolt hole in the flexible coupling. Fit and tighten the pinch bolt securely.

(2) Instal the steering column as previously described. Ensure that the steering gear has not been moved and is still in a centralised position.

5. STEERING GEAR ASSEMBLY

Special Equipment Required:

To Remove Tie Rods – Suitable puller

To Remove and Instal Pinion Bearing Screw – Suitable tapered socket

TO RENEW DUST BOOTS

(1) Remove the tie rods as later described under the heading Steering Linkage.

(2) Use a suitable pair of pliers to break the dust boot retaining clips from the outer ends of the dust boots.

(3) Remove the the left hand steering gear clamp

retaining nuts and remove the clamp and the rubber mounting.

(4) Depress both sides of the centre cover at 90 degrees to the tie rod attaching holes and slide the cover and dust boots from the left hand side of the housing.

(5) Temporarily instal the tie rod attaching bolts to prevent the rack bush from being displaced from its position on the rack assembly.

(6) Remove the clips retaining the dust boots to the centre cover and remove the dust boots.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Ensure that the spacers are correctly positioned in the centre cover.

(2) Fit the large end of the dust boots over each end of the centre cover and instal new retaining clips. Tighten the clips securely but not excessively, to prevent distortion of the centre cover.

(3) Slide the dust boots and centre cover assembly over the rack and fit the right hand dust boot to the steering gear housing and secure the boot with a new retaining clip.

(4) Fit the left hand rubber mounting to the steering gear and instal the retaining clamp and nuts. Torque the nuts to Specifications.

(5) Set the end of the left hand dust boot 50 mm back from the end of the housing assembly and secure the boot with a new retaining clip.

(6) Instal the tie rod retaining bolts through the lock washer, plate and the tie rod bushes and torque the retaining bolts to Specifications. Fold the lock washer over the heads of the retaining bolts.

TO REMOVE AND INSTAL

(1) Disconnect the negative battery terminals.

(2) Remove the air cleaner assembly from the carburettor. If necessary refer to the Fuel System section for the correct procedure.

(3) Working inside the vehicle, remove the lower trim panel from above the brake pedal.

(4) Remove the bolts securing the steering column boot to the bulkhead. Slide the retaining ring and boot back to gain access to the steering flexible coupling.

(5) Remove the flexible coupling lower pinch bolt.

(6) Raise the front of the vehicle and support it on chassis stands. Refer to the Wheels and Tyres section for the correct procedure.

(7) Remove the split pins if applicable and the tie rod end retaining nuts. Use a suitable puller to remove the tie rods ends from the steering arms.

(8) Mark the left hand front road wheel in relation to the hub assembly to ensure it is refitted in its original position and remove the wheel from the vehicle.

(9) Remove the steering gear clamp retaining nuts and lift off the clamps.

(10) Lower the steering gear away from the bulkhead sufficiently to disengage the pinion shaft from the steering flexible coupling.

(11) Remove the steering gear assembly out through the left hand wheel arch.

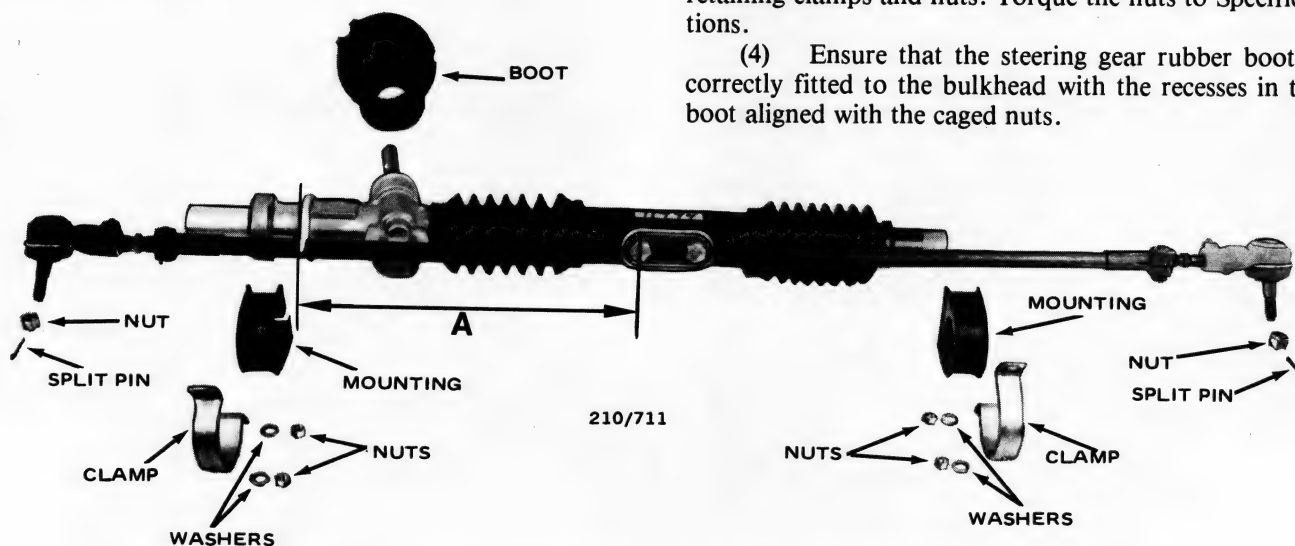
Installation is a reversal of the removal procedure with attention to the following points:

(1) Align the mark on the right hand tie rod with the mark on the steering gear housing to ensure the steering gear is centralised. If the marks are not visible the steering gear can be centralised by measuring the distance between the inner face of the mounting flange on the right hand side of the steering gear and the centre of the right hand tie rod to steering gear retaining bolt. When the steering is centralised this measurement should be 302 mm.

(2) Fit the steering gear assembly to the vehicle through the left hand wheel arch.

(3) Align the pinch bolt hole in the flexible coupling with the groove in the pinion shaft, slide the pinion shaft onto the steering coupling and fit the steering gear retaining clamps and nuts. Torque the nuts to Specifications.

(4) Ensure that the steering gear rubber boot is correctly fitted to the bulkhead with the recesses in the boot aligned with the caged nuts.



View of steering gear showing measuring points for steering gear alignment. A = 302 mm.

(5) Connect the tie rod ends to the steering arms and instal the retaining nuts, torque the nuts securely and instal new split pins if applicable.

(6) Align the marks made on removal of the front wheel and tighten the wheel bolts as much as possible. Lower the vehicle to the ground and retighten the wheel bolts securely.

(7) Instal the flexible coupling lower pinch bolt and tighten the bolt securely.

(8) Fit the steering column rubber boot ring and tighten the retaining bolts securely.

(9) Instal the air cleaner and connect the battery.

TO DISMANTLE

(1) Remove the steering gear from the vehicle as previously described and thoroughly clean the outer surfaces of the steering gear in a suitable cleaning solvent.

(2) Clamp the flanges of the right hand mounting bracket in a soft jawed vice to support the steering gear assembly during overhaul. The steel tube section of the steering gear should not be gripped in the vice as damage to the outer tube will result.

(3) Using a suitable hammer and drift knock back the lock washer from the heads of the tie rod retaining bolts.

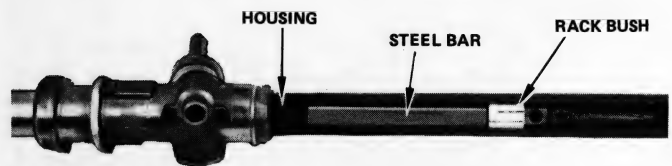
(4) Suitably mark the tie rods to ensure their correct reassembly. Remove the tie rod attaching bolts, lock washer and plate from the steering gear and remove the tie rod assemblies from the steering gear.

(5) Remove the rubber mounting from the left hand side of the steering gear housing.

(6) Use a pair of pliers to break the dust boot retaining clips.

(7) Depress both sides of the centre cover at 90 degrees to the tie rod attaching holes and slide the cover

210/715



View of steering gear with centre cover and dust boots removed and steel bar in correct position to remove rack bush.

and dust boots from the left hand side of the housing. Collect the spacers.

(8) Insert a suitable steel bar into the slot in the rack housing between the rack bush and the pinion shaft end of the slot. See illustration. Turn the pinion shaft until the rack bush is forced off the steering rack.

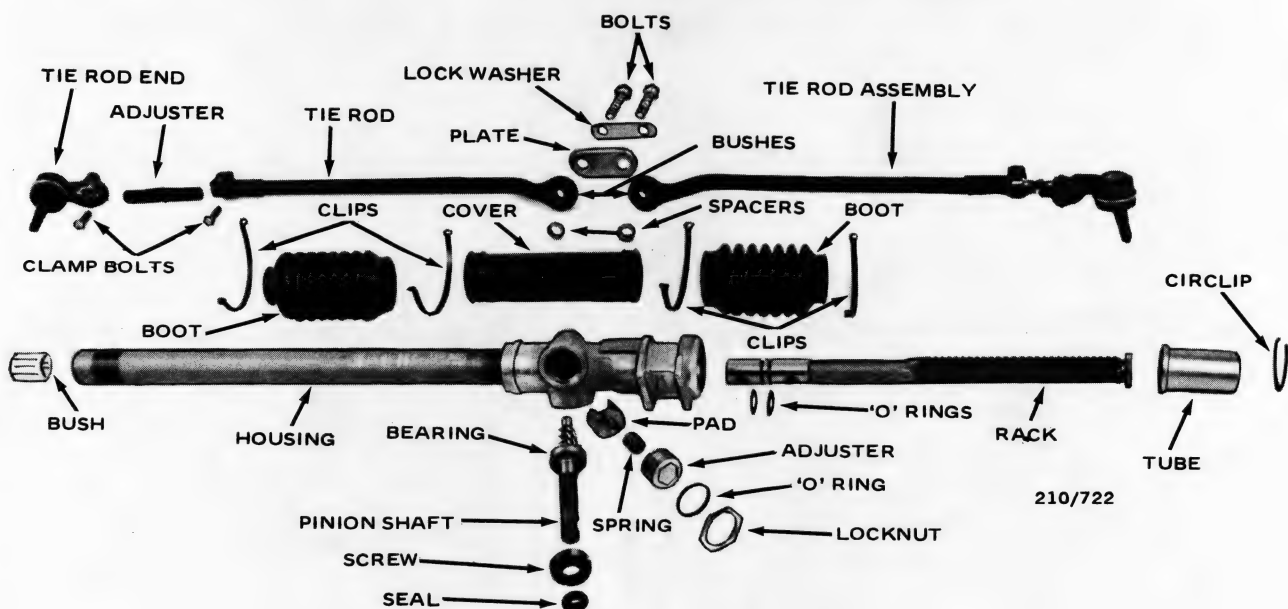
(9) Turn the lock stop tube retaining circlip in its groove until the ends of the circlip are aligned with the notch in the housing. Remove the circlip and turn the steering gear onto the left hand lock to free the tube. Use a pair or multi grip pliers positioned at the very end of the lock stop tube to work the tube free of the housing.

(10) Remove the locknut from the rack pad adjusting screw and remove the adjuster. Lift out the spring and the rack pad.

(11) Remove the retaining screw from the pinion bearing using the special tool.

(12) Remove the pinion and upper bearing assembly from the housing.

NOTE: The lower pinion bearing is not replaceable and should not be removed. If the bearing is damaged or worn the housing assembly must be replaced.



210/722

Dismantled view of steering gear assembly.

(13) Withdraw the rack from the right hand side of the housing. Do not attempt to remove the knurled nut from the rack. With a thin screwdriver remove the two 'O' rings from the rack.

TO CLEAN AND INSPECT

(1) Thoroughly clean all parts in a suitable cleaning solvent.

(2) Inspect the steering gear boots for splits and deterioration and renew as necessary.

(3) Inspect the rack pad adjuster spring for damage and the rack pad surface for wear and replace as necessary.

(4) Inspect the rack bush, the rack 'O' rings, the pinion shaft seal and the rack pad adjuster 'O' ring and replace as necessary. If the steering gear assembly is dismantled for overhaul, it is recommended that the components mentioned are renewed as a matter of course.

(5) Inspect the teeth on the rack and the pinion for chipping or damage and renew as necessary.

(6) Inspect the pinion upper and lower bearings for wear or damage. Replace the upper bearing as necessary. Wear or damage of the lower bearing will necessitate renewal of the housing assembly.

(7) Inspect the tie rod bushes for wear or damage and replace as necessary.

(8) Inspect the steering gear housing for bend, wear or damage and renew as necessary.

(9) Inspect the tie rods for bend, wear or damage and renew as necessary.

TO ASSEMBLE

Assembly is a reversal of the dismantling procedure with attention to the following points:

(1) Carefully instal the 'O' rings into the grooves in the rack.

(2) Liberally lubricate the sliding surfaces and moving parts with Shell Alvania EPRO grease.

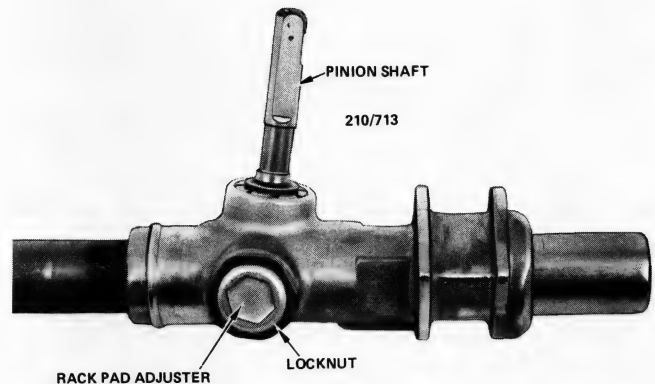
(3) Slide the rack into the steering gear housing from the right hand side until the rack teeth are visible through the pinion shaft bore.

(4) Stand the steering housing vertically on a bench with the pinion shaft end of the housing facing down. Instal the right hand tie rod retaining bolt to assist in alignment of the rod bush. Lubricate the rack bush and instal it onto the rack using a suitable tubular drift. Instal the bush onto the rack until it is centrally aligned between the tie rod retaining bolt holes. Ensure that the rubber 'O' rings are still correctly installed on the rack.

(5) Lubricate the upper and lower pinion bearings with grease and add 50 grams of Shell Alvania EPRO grease to the bore of the pinion housing.

(6) Centralise the rack in the housing by measuring the distance between the inner face of the mounting flange on the right hand side of the steering gear and the centre of the right hand tie rod to steering gear retaining bolt. The measurement must be 302 mm.

(7) With the rack centralised, fit the pinion shaft



View of rack pad adjusting point.

and bearing to the pinion bore with the flexible coupling bolt slot pointing to the right hand end of the housing.

(8) Lightly grease the inner lip of the pinion shaft seal and place the seal squarely in the pinion bearing screw. With a suitable size socket which will fit neatly on the outer edge of the seal drive the seal into the recess in the pinion bearing screw.

(9) Instal the pinion bearing retaining screw and torque the screw to Specifications using the special tool.

(10) Carefully fit the 'O' ring seal to the rack pad adjusting screw and slightly lubricate the seal with grease.

(11) Fit the rack pad, the spring and the rack pad adjusting screw to the housing and instal but do not tighten the locknut. Ensure the locknut is positioned with the 'INSIDE' marking to the steering gear housing.

(12) Torque the rack pad adjusting screw to Specifications.

(13) Hold the adjusting screw in position and torque the locknut to Specifications.

(14) Loosely instal the left hand tie rod retaining bolt to prevent movement of the rack bush. Use a suitable adapter to connect a torque wrench to the pinion shaft. Check that the torque needed to turn the pinion shaft from lock to lock does not exceed 2 Nm and is consistent over its full travel.

(15) With a pin punch and a hammer, stake the housing to two of the slots in the pinion bearing retaining screw.

(16) Gently tap the lock stop tube into position in the housing using a soft faced hammer.

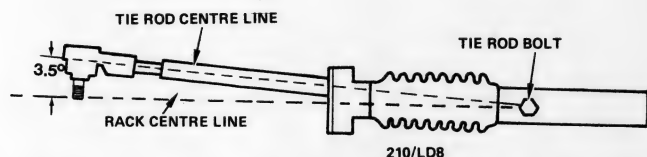
(17) Fit the lock stop tube retaining circlip over the tube and into the groove in the housing with the ends of the circlip aligned with the notch in the housing.

(18) Instal the right hand dust boot, small end first over the housing.

(19) Instal the spacers into the centre cover, slide the cover over the housing and into the dust boot and align the tie rod retaining bolt holes in the cover with the holes in the rack.

(20) Instal the left hand dust boot with the larger end towards the centre cover. Fit the dust boot over the centre cover.

(21) Fit new retaining clips to the dust boot to centre cover joints.



Schematic view of left hand side of steering gear showing the angle at which the tie rod must be set in relation to the steering gear before installation.

(22) Ensure that the centre cover and rack bolt holes are still aligned. Set the end of the left hand dust boot 50 mm from the end of the housing assembly and secure the boot with a retaining clip.

(23) Fit a retaining clip to secure the right hand dust boot to the pinion housing.

(24) Ensuring that the spacers have not been dislodged, instal the tie rods to the steering gear and fit the bolts, a new lock washer and the plate and tighten the bolts finger tight.

(25) Fit the left hand mounting rubber to the steering gear housing.

(26) Before torquing the tie rod retaining bolts to Specifications the tie rod operating angle must be set to 3.5 degrees in relation to the centre line of the steering rack. See the illustration for the correct measuring points. Bend over the lock washer to prevent the bolts loosening during service.

(27) Fit the steering gear to the vehicle as previously described.

6. STEERING LINKAGE

Special Equipment Required:

To Remove Tie Rods - Suitable puller

To Remove Tie Rod Bushes - Suitable press, press plates and spacers

NOTE: The procedure to remove a tie rod is identical for either the right or left hand tie rod.

TO REMOVE AND INSTAL

(1) Raise the front of the vehicle and support on chassis stands. Refer to the Wheels and Tyres section for the correct procedure.

(2) Remove the split pin if applicable securing the tie rod end retaining nut and remove the nut.

(3) Disconnect the tie rod end from the steering arm with the aid of a suitable puller.

(4) Using a suitable hammer and drift, knock back the lock washer from the heads of the tie rod retain-



View of tie rod assembly.

ing bolts. Suitably mark the tie rods and tie rod ends to ensure their correct positioning on assembly.

(5) Remove the bolt securing the tie rod which is to be removed. Loosen the other tie rod retaining bolt and swing the plate up. Release the tie rod and remove the tie rod assembly through the inner wheel arch.

(6) Temporarily instal the tie rod retaining bolt finger tight into position to prevent the spacer in the centre cover from becoming dislodged.

(7) Loosen the tie rod end clamp bolt and remove the tie rod end from the adjuster. Note the number of turns required to unscrew the tie rod end.

(8) If necessary, loosen the adjuster clamp bolt and remove the adjuster from the tie rod. Note the number of turns required to unscrew the adjuster.

(9) Inspect the tie rod, the adjuster and the tie rod end for wear and damage, pay particular attention to the tie rod end boot and renew as necessary.

If necessary, the inner tie rod bush can be replaced using suitable spacers, press and press plates.

Ensure that the new bush is installed centrally in the tie rod with the outer flanges of the bush correctly fitted over the edges of the tie rod.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Check that the centre cover spacer has not been dislodged from its position in the cover.

(2) Fit the tie rod retaining bolt finger tight.

(3) Fit the adjuster to the tie rod and the tie rod to the adjuster, ensuring that they are screwed on the same number of turns noted during dismantling.

(4) Instal the tie rod end to the steering arm and instal and tighten the retaining nut securely. Instal a new split pin if applicable, to prevent the nut loosening during service.

(5) Lower the vehicle to the ground.

(6) With the weight of the vehicle on its wheels torque the tie rod retaining bolts to Specifications. Fold the lock washer over the heads of the retaining bolts.

(7) Check and if necessary adjust the front wheel toe in/out as described in the Front Suspension section under the Suspension and Steering Angles heading.

(8) Securely tighten the tie rod end and adjuster clamp bolts.

SPECIFICATIONS

Type McPherson strut type suspension unit with coil spring and lower control arm

Shock absorber:

Type Wet strut
Fluid capacity 290 ml
Fluid type To meet manufacturers specification HN 1582

Coil spring:

Identification Tag on spring
Code JA, JB, JE

Free length -

JA 376 mm
JB 376 mm
JE 380 mm

Stabiliser bar diameter:

Steel wheels 19.0 mm
Alloy wheels with 60 series tyres 17.0 mm

Front wheel bearings Sealed, non-adjustable

* Camber angle -1 deg 15 min to + 15 min

* Caster angle 0 to 2 deg

** Toe in/out 0.5 mm toe out to 1.5 mm toe in

* Camber and Caster to be checked with 70 kg on each front seat.

** Toe in/out to be checked at normal kerb weight with no load on front seats.

TORQUE WRENCH SETTINGS

* Control arm to carrier bolts 110 Nm

* Control arm carrier to body bolts 110 Nm

Replacement control arm ball joint bolt nuts .. 65 Nm

Piston rod self locking nut 70 Nm

Gland nut 135 Nm

Tie rod end ball joint stud nut 90 Nm

Stabiliser bar to body bolts 25 Nm

Suspension unit upper mounting nuts 20 Nm

Drive shaft to hub retaining nut Refer text

* Micro-encapsulated bolts.

1. FRONT SUSPENSION TROUBLE SHOOTING

FRONT END NOISE

(1) Loose upper suspension mounting or piston rod nut: Tighten mounting or piston rod nut.

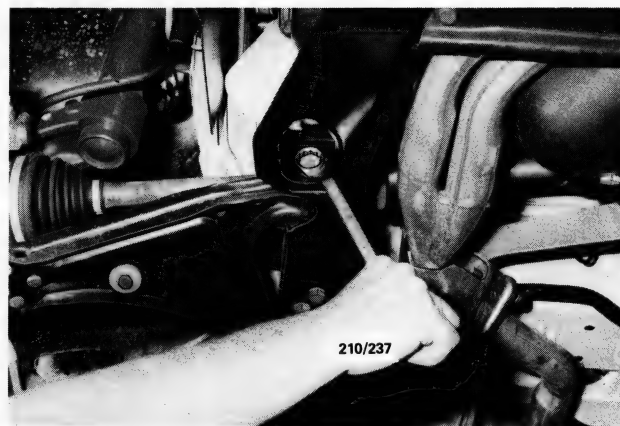
(2) Loose or worn lower ball joint: Tighten or renew lower ball joint.

(3) Noise in suspension unit: Overhaul or renew suspension unit, preferably in pairs.

(4) Worn steering gear components: Renew defective components.

(5) Loose or worn front hub bearings: Replace front hub bearings.

(6) Loose or defective stabiliser bar mounting: Check, tighten or renew mounting rubbers.



Check the inner control arm mountings for tightness.

NOTE: To check the front suspension components for wear, first raise the front of the vehicle, support on chassis stands and allow both front wheels and suspension units to hang free. With an assistant pushing and pulling the front road wheels in and out at the top and then at the bottom, check for excessive looseness at the front hub bearings, control arm ball joints and inner pivot bushes. As a further check on the inner pivot bushes have the assistant push the wheel firmly towards the rear and then towards the front of the vehicle. Stabiliser bar mounting rubbers can be visually checked for damage or deterioration.



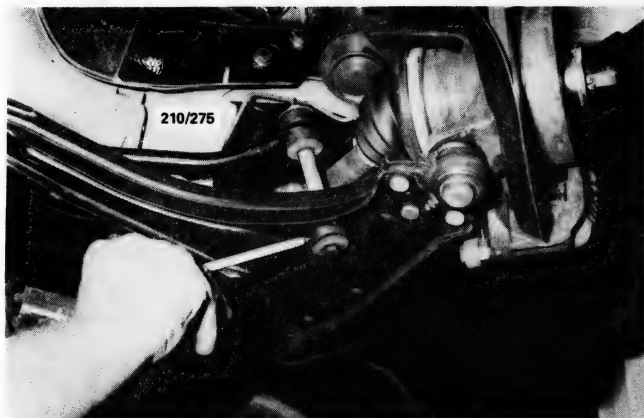
Push and pull the front road wheels at the top and bottom to check for excessive looseness in the suspension ball joints or hub bearings.

POOR OR ERRATIC ROAD HOLDING ABILITY

(1) Low or uneven tyre pressures: Inflate tyres to recommended pressures.

(2) Defective suspension unit: Check, overhaul or renew faulty unit, preferably in pairs.

(3) Incorrect front end alignment: Check and adjust alignment as necessary.



Check the stabiliser bar mounting bushes for wear or deterioration.

- (4) Loose or defective stabiliser bar mounting rubbers: Check and tighten or renew mounting rubbers.
- (5) Weak or uneven front coil springs: Check and renew front coil springs as a pair.
- (6) Broken or weak rear spring: Renew both rear springs as a matching pair.
- (7) Defective ball joint: Replace defective joint.

NOTE: As a quick guide to suspension unit condition, bounce the front of the vehicle up and down (one side at a time) and observe that the vehicle should come to rest in a single movement. If it bounces two or three times before stopping the suspension unit should be removed and overhauled. If the front of the vehicle is laying down further on one side than the other, remove the coil spring and check its free length against Specifications or a new spring. If the spring is found to be unserviceable it is good practice to fit two new springs as a matching pair. This also applies to the springs on the rear of the vehicle.

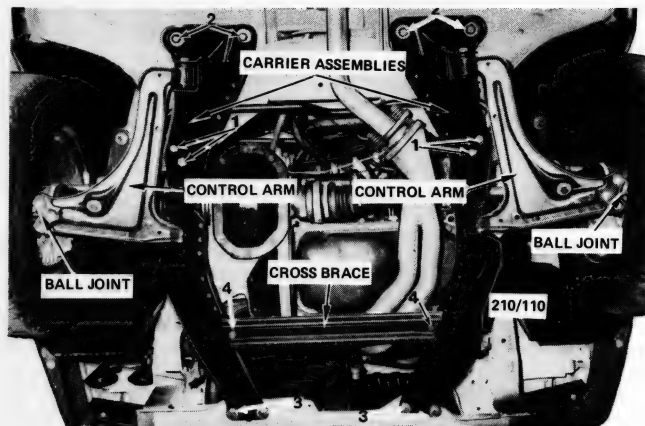
2. DESCRIPTION

Each side of the front suspension consists of a strut type suspension unit, a lower control arm, a stabiliser bar and a carrier assembly.

The suspension unit is comprised of a tubular shock absorber which is an integral part of the steering knuckle. The lower spring seat and steering arm are welded to the strut.

The coil spring is located between the lower spring seat and the upper spring seat. The bearing and upper suspension mounting are fitted above the upper spring seat and the assembly is retained in position by the piston rod and retaining nut.

The lower control arm is fitted with a ball joint at its outer end which is mounted to the steering knuckle. The ball joint body is rivetted to the control arm. The inner end of the control arm pivots on two rubber bushes secured by bolts to the carrier assembly.



Installed view of front suspension assembly showing correct tightening sequence for carrier assemblies.

The stabiliser bar is mounted to the body subframe at two points above the carrier assembly. The outer ends of the stabiliser bar are connected to the control arm by a rubber bushed link bolt assembly.

The camber and caster angles are set in production and cannot be adjusted in service. Any variation from Specifications will be caused by worn or damaged components. The toe in/out is adjustable as outlined under the Suspension and Steering Angles heading.

3. SUSPENSION UNIT

Special Equipment Required:

To Remove and Instal – Ball joint stud puller, front hub holding tool

To Dismantle and Assemble – Spring compressor, gland nut wrench

TO REMOVE AND INSTAL

(1) Raise the front of the vehicle and support it on chassis stands. Refer to the Wheels and Tyres section for the correct procedure.

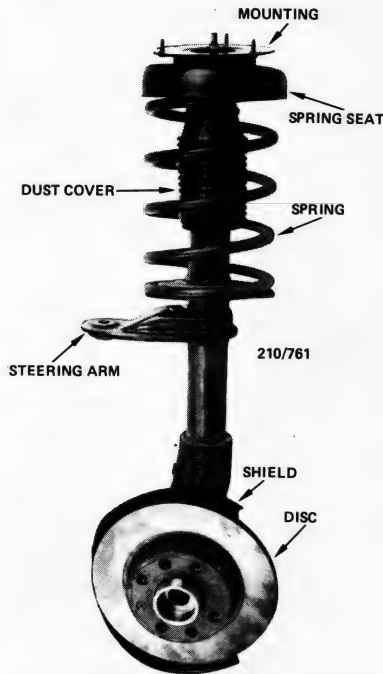
(2) Suitably mark the road wheel in relation to the front hub to aid assembly and remove the road wheel.

(3) Remove the brake caliper assembly as described in the Brakes section. Suspend the caliper from the underbody with a piece of wire so that the weight of the caliper is not taken by the brake hose.

(4) Remove the split pin, where fitted, and the tie rod end retaining nut. Use a suitable puller to disconnect the tie rod end from the steering arm. Do not use a hammer to separate the tie rod end from the steering arm.

(5) Remove the split pin and unscrew the retaining nut as far as possible from the lower ball joint. Disconnect the ball joint from the steering knuckle using a suitable ball joint stud puller or alternatively place a suitable dolly or hammer against one side of the steering knuckle eye and strike the opposite side with a hammer.

(6) Open the bonnet and working in the engine compartment, scribe a line across the upper suspension



View of suspension unit removed from vehicle.

mounting and the body to ensure that the upper mounting is returned to its original position.

(7) Loosen but do not remove the upper mounting nuts inside the engine compartment.

(8) Attach a suitable front hub holding tool to the front hub, remove the split pin and unscrew the nut securing the drive shaft to the front hub. Remove the holding tool.

(9) Tap the end of the drive shaft with a soft faced hammer, while pulling outwards on the bottom of the suspension unit to release the hub from the drive shaft splines. During this operation ensure the drive shaft is not disengaged from the transaxle.

(10) Suspend the driveshaft from the underbody with a piece of wire, so that the drive shaft is supported and its weight is not taken by the constant velocity joints or boots.

(11) Remove and discard the upper mounting nuts and manoeuvre the suspension unit from the vehicle.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Instal the suspension unit to the vehicle and loosely instal new upper mounting nuts. Ensure the marks previously made on the mounting and body are aligned.

(2) Lubricate the splines of the drive shaft with Castrol 80 W gear oil. Swing the suspension unit away from the body to allow the drive shaft to be inserted in the hub. Ensure the drive shaft splines are correctly aligned with the internal splines of the hub.

(3) Instal the old drive shaft nut and washer, attach a suitable front hub holding tool to the front hub and pull the drive shaft into the hub.

(4) Fit the tie rod end to the steering arm, torque

the retaining nut to Specifications and, where necessary, instal a new split pin.

(5) Instal the lower ball joint, tighten the retaining nut securely and fit a new split pin.

(6) Torque the upper suspension unit mounting nuts to Specifications.

(7) Remove the old drive shaft retaining nut and washer used to fit the drive shaft to the hub. Secure with a new nut and washer and tighten using the following procedure:

(a) Initially torque the nut to 100 Nm.

(b) Back off the nut until it is free to turn by hand.

(c) Tighten the nut to 20 Nm plus 90 degrees.

(d) If necessary, to align the split pin hole, back off the nut.

(e) Instal a new split pin and remove the front hub holding tool.

(8) Instal the brake caliper as described in the Brakes section.

(9) Instal the road wheel ensuring the marks made on removal are aligned and tighten the wheel bolts as much as possible.

(10) Lower the vehicle to the ground and securely tighten the road wheel bolts.

TO DISMANTLE AND ASSEMBLE

NOTE: The shock absorber may be dismantled and assembled using a new piston rod guide, 'O' ring and gland nut and the correct amount and type of shock absorber fluid. For this operation do not remove the piston rod from the shock absorber tube. If the suspen-



Coil spring and components removed from front suspension unit.

(10) Instal the upper mounting, the retainer and a new self locking nut to the piston rod. Torque the nut to Specifications.

(11) Release the spring compressor and ensure that the upper mount turns freely on the bearing.

(12) Instal the suspension unit to the vehicle as previously described.

4. FRONT HUB BEARINGS

Special Equipment Required:

To Renew Bearings – Suitable press and press plates

TO RENEW

(1) Remove the suspension unit from the vehicle as previously described.

(2) Remove the brake disc locating screw and withdraw the brake disc from the hub.

(3) Remove the screws securing the brake dust shield to the steering knuckle and manoeuvre the dust shield into such a position to prevent damage during the following operation.

(4) Support the steering knuckle assembly on suitable press plates and with an appropriate size drift press the hub from the hub bearing. Remove the brake dust shield.

NOTE: The inner race of the bearing may remain on the hub assembly. Separate the race from the hub using the press and press plates.

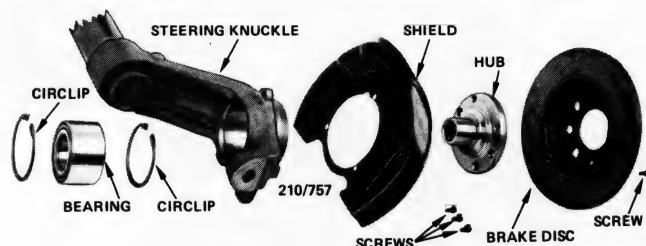
(5) Use circlip pliers to remove the inner and outer circlips retaining the hub bearing in the steering knuckle assembly.

(6) Using a tubular drift slightly smaller in diameter than the hub bearing bore in the steering knuckle, press the bearing out of the steering knuckle from the drive shaft side.

(7) Thoroughly clean the steering knuckle assembly and components in a suitable solvent.

NOTE: The hub bearing is pre-lubricated and therefore requires no lubrication on assembly or during service. The bearing should never be immersed in cleaning solvent.

Installation is a reversal of the removal procedure with attention to the following points:



Dismantled view of front hub assembly.

(1) Instal the outer circlip in its groove in the steering knuckle with the open ends of the circlip facing towards the bottom of the knuckle. Fit the hub bearing to the steering knuckle using a press and a tubular drift slightly smaller than the hub bearing bore in the steering knuckle. Press only on the outer race of the bearing.

(2) Instal the bearing until it just contacts the outer circlip. Do not use excessive pressure or the steering knuckle assembly could be broken at the circlip groove.

(3) Fit the inner circlip into its groove in the steering knuckle with the open ends of the circlip facing downwards.

(4) Fit the brake dust shield to the steering knuckle and tighten the retaining screws securely.

(5) Support the inner bearing race on a tubular spacer with an inside diameter slightly larger than the bearing inner bore.

(6) Press the hub into the bearing until it is fully seated against the bearing face.

(7) Fit the brake disc to the hub and instal and tighten the locating screw securely.

(8) Instal the suspension unit to the vehicle as previously described.

5. CONTROL ARM BALL JOINT

Special Equipment Required:

To Disconnect Ball Joint – Suitable puller

TO RENEW

(1) Raise the front of the vehicle and support it on chassis stands. Refer to the Wheels and Tyres section for the correct procedure.

(2) Suitably mark the road wheel in relation to the front hub to aid assembly and remove the road wheel.

(3) Working from beneath the control arm use a centre punch to mark the centre of the ball joint retaining rivets.

(4) Drill a 3 mm hole through the rivets to act as a guide, then drill out the rivet heads using a 12 mm drill.

(5) Use a suitable punch to drive the rivets out of the control arm.

(6) Remove the split pin and unscrew the retaining nut as far as possible from the ball joint. Disconnect the ball joint from the steering knuckle using a puller or alternatively place a suitable dolly or hammer against one side of the steering knuckle eye and strike the opposite side with a hammer.

(7) Remove the ball joint from the control arm. Installation is a reversal of the removal procedure with attention to the following points:

(1) Fit the ball joint to the control arm using the nuts and bolts supplied with the new ball joint. Ensure the bolts are fitted through the control arm from below with the retaining nuts on top of the control arm. Tighten the retaining nuts to Specifications.

(2) Fit the ball joint to the steering knuckle,

tighten the retaining nut securely and instal a new split pin.

(3) Instal the road wheel ensuring the marks made on removal are aligned and tighten the wheel bolts as much as possible.

(4) Lower the vehicle to the ground and securely tighten the road wheel bolts.

6. CONTROL ARM AND BUSHES

Special Equipment Required:

To Disconnect Ball Joint - Suitable puller

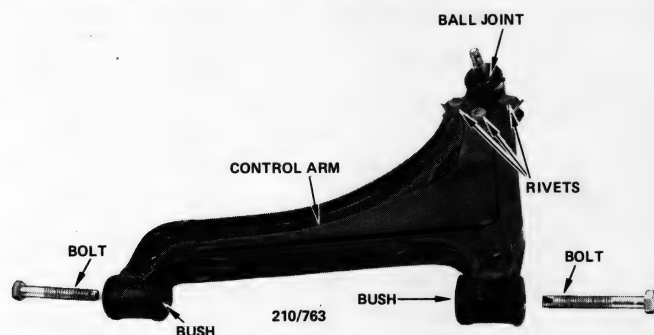
To Renew Control Arm Bushes - Suitable press and press plates.

TO REMOVE AND DISMANTLE

(1) Raise the front of the vehicle and support it on chassis stands. Refer to the Wheels and Tyres section for the correct procedure.

(2) Suitably mark the road wheel in relation to the front hub to aid assembly and remove the road wheel.

(3) Disconnect the stabiliser bar to control arm link bolt nut. Remove the link bolt and mounting components noting their installed positions.



View of control arm removed from vehicle.

(4) Remove the split pin and unscrew the nut securing the ball joint to the steering knuckle as far as possible. Disconnect the ball joint from the steering knuckle using the puller or alternatively place a suitable dolly or hammer against one side of the steering knuckle eye and strike the opposite side with a hammer.

(5) Remove the two control arm to carrier retaining bolts and remove the control arm from the vehicle.

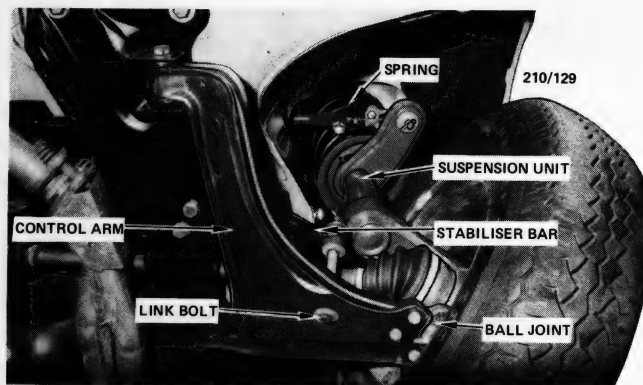
(6) If necessary, using the press and press plates, press the front and rear bushes from the control arm.

(7) Inspect the ball joint for wear or damage and replace as necessary.

(8) Inspect the control arm for cracks, fatigue or bend and replace as necessary.

TO ASSEMBLE AND INSTAL

Assembly and installation is a reversal of the removal and dismantling procedure with attention to the following points:



Underbody view of right hand side suspension assembly.

(1) Where removed, liberally coat the new control arm bushes with a soap and water solution and using the press and press plates instal the bushes into the control arm. Ensure that each bush is centralized in the control arm and that the bush projects from each side of the control arm $8 \text{ mm} \pm 0.5$

NOTE: The rear bush can be identified by a blue paint mark on the bush. This bush is softer than the front bush and they must not be interchanged.

(2) Manoeuvre the control arm into the carrier assembly and instal new retaining bolts no more than five turns.

NOTE: The control arm retaining bolts are special micro-encapsulated fasteners. They must not be reused. New bolts must be of the same strength classification as the bolts being replaced.

(3) Connect the ball joint to the steering knuckle, tighten the retaining nut securely and instal a new split pin.

(4) Instal the stabiliser bar mounting link bolt and components. If necessary refer to the heading Stabiliser Bar and torque the bolt to Specifications.

(5) Instal the road wheel ensuring the marks made on removal are aligned and tighten the wheel bolts as much as possible.

(6) Lower the vehicle to the ground and securely tighten the road wheel bolts.

(7) Bounce the front of the vehicle up and down several times to settle the suspension into its normal running position.

(8) Torque the control arm to carrier bolts to Specifications.

7. STABILISER BAR

TO REMOVE AND INSTAL

(1) Raise the front of the vehicle and support it on chassis stands. Refer to the Wheels and Tyres section for the correct procedure.

(2) Suitably mark the road wheels in relation to their respective hubs to aid assembly and remove both front road wheels.

(3) Fold back the lug of the clip securing the brake and fuel lines to the right hand side carrier assembly and release the brake and fuel lines.

(4) Remove the stabiliser bar to control arm link bolt nuts, note their installed positions and remove the link bolts and the remaining link components.

(5) Remove the four bolts retaining the front of the carrier assemblies to the vehicle body and discard the bolts. Instal new mirco-encapsulated bolts into the four front mounting positions. Only tighten the bolts three or four turns to avoid activating the self locking properties of the bolts.

(6) Place a suitable piece of wood across the head of a jack and raise the jack sufficiently to support the carrier assemblies.

(7) Remove the remaining carrier bolts and lower the carrier assemblies sufficiently so that access can be gained to the stabiliser bar mountings.

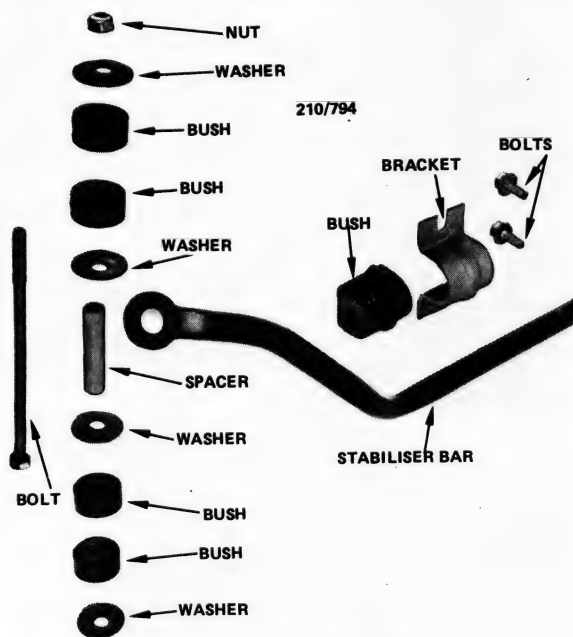
(8) Remove the stabiliser bar to chassis mounting bolts. Lift off the mounting brackets and manoeuvre the stabiliser bar from beneath the vehicle.

(9) Remove the stabiliser bar mounting rubbers from the stabiliser bar, inspect the mounting rubbers for wear and damage and renew as necessary.

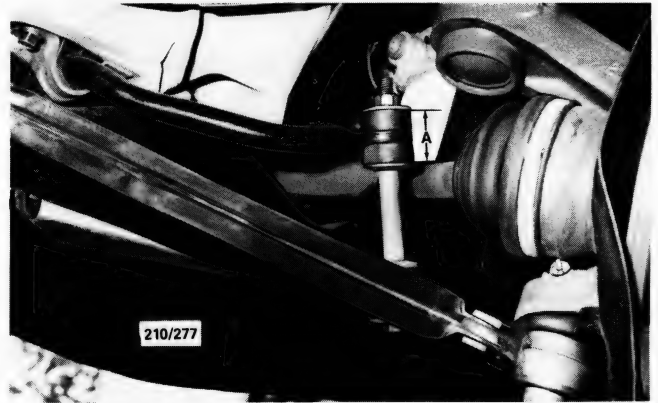
(10) Check the stabiliser bar for cracks and fatigue and renew as necessary.

(11) Inspect the stabiliser bar link components for wear and damage, pay particular attention to the rubber bushes and renew as necessary.

Installation is a reversal of the removal procedure with attention to the following points:



Dismantled view of front stabiliser bar and mounting components.



Tighten the stabiliser bar mounting link bolt nut until dimension A = 38 mm.

(1) Coat the stabiliser bar mounting rubbers with a rubber lubricant to aid assembly.

(2) Instal the stabiliser bar mounting rubbers onto the stabiliser bar.

(3) Instal the stabiliser bar to the vehicle and loosely connect the stabiliser bar brackets to the body.

(4) Loosely instal the stabiliser bar connecting link assembly to both sides as noted during the removal procedure.

(5) Tighten the bolts retaining the stabiliser bar brackets to the body to the specified torque.

(6) Raise the jack until the carrier assemblies are positioned against the vehicle chassis.

(7) Instal new mirco-encapsulated bolts into the eight rear carrier assembly mountings. Do not tighten the bolts more than four turns.

(8) Tighten the carrier assembly mounting bolts to Specifications in the sequence shown in the illustration.

(9) Fit the fuel and brake lines in position on the right hand carrier and secure with the retaining clip.

(10) Tighten the stabiliser bar link bolts until the dimension shown in the illustration is obtained.

(11) Fit the road wheels ensuring that the marks made on removal are aligned and tighten the wheel bolts as much as possible.

(12) Lower the vehicle to the ground and securely tighten the road wheel bolts.

8. SUSPENSION AND STEERING ANGLES

ADJUSTMENT

NOTE: Extensive knowledge and specialised equipment is required to measure and correct the suspension and steering angles except the front wheel toe in. It is therefore not a worthwhile proposition for the average person to carry out a complete wheel alignment and the vehicle should be taken to a wheel alignment specialist.

Prior to carrying out a wheel alignment, carry out a thorough inspection of the steering linkages, front hub

bearing adjustment, suspension ball joints, spring and suspension strut unit recoil action. Renew or repair as necessary.

The tread of the front tyres should be examined for excessive or uneven wear as certain conditions of tyre wear are indicative of damaged or worn components in the suspension, steering linkage and/or wheels and bearings.

Refer to Tyre Wear Diagnosis in the Wheels and Tyres section.

If the tyres are found to be defective, renew with serviceable tyres.

TO CHECK AND ADJUST TOE IN/OUT

NOTE: The vehicle should be unladen, except for the normal amount of fuel and with the tyres inflated to the normal pressures.

- (1) With the vehicle on a level floor, jack up the front of the vehicle and support on stands.
- (2) Spin each front wheel in turn and using a piece of chalk, mark a line around the periphery at the inside of each tyre as near to the centre as possible.
- (3) Lower the front of the vehicle to the ground and bounce the suspension to achieve normal levels.
- (4) Set the wheels in a straight ahead position.
- (5) Mark the centre chalk line on both tyres at a point approximately 200 mm above the floor and in front of the suspension.
- (6) Using a suitable telescopic gauge, measure and record the distance between the two points on the tyre centres.



Underbody view of right hand tie rod adjuster and clamp bolts.

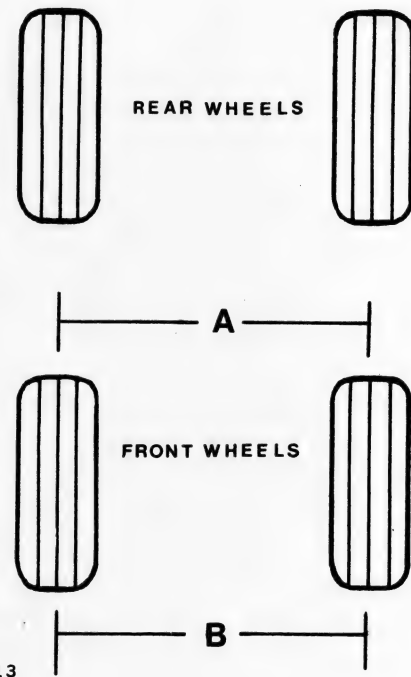


Diagram indicating front wheel toe in. Refer to Specifications for the correct difference between measurement A and B.

- (7) Maintain the wheels in the straight ahead position, roll the vehicle forward until the marks are the same distance from the floor but to the rear of the suspension.
- (8) Again use the telescopic gauge to measure and record the distance between the marks on the tyres.
- (9) The difference between the front and rear measurement will give the correct toe in/out reading. See Specifications. If the larger measurement is at the front, the wheels are in a toe out position. If the reverse is true the wheels are in a toe in position.
- (10) If adjustment of the toe in/out is necessary loosen the tie rod adjuster clamp bolts on both sides.
- (11) Turn the adjusters as required until the correct toe in/out reading is reached.

NOTE: It is important to turn each adjuster equally to maintain the central position of the steering gear. Ensure that the exposed portion of the adjuster does not exceed 55 mm in length.

- (12) Tighten the tie rod adjuster clamp bolts without changing the positions of the adjusters.

SPECIFICATIONS

Type Trailing compound crank axle
Shock absorbers Non-repairable telescopic hydraulic

Coil spring:

Identification Tag on spring

Code ZG

Free length -

Nominal 233 mm

Max variation + 20 mm - 10 mm

Stabiliser bar diameter 16 mm

* Camber angle 0 deg to -1 deg

* Toe in/out 2.0 mm toe out to 6.0 mm toe in

* Camber and toe in/out to be checked with 70 kg on each front seat.

TORQUE WRENCH SETTINGS

Axle assembly pivot bolt nuts 120 Nm

Stabiliser bar to axle assembly bolt nuts 85 Nm

Stub axle to axle assembly bolts 60 Nm + 35 deg

Shock absorber lower mounting bolts 60 Nm

Shock absorber upper mounting nuts 34 Nm

1. REAR SUSPENSION TROUBLE SHOOTING

NOISE IN SUSPENSION

(1) Defective shock absorber and/or mountings: Renew faulty components.

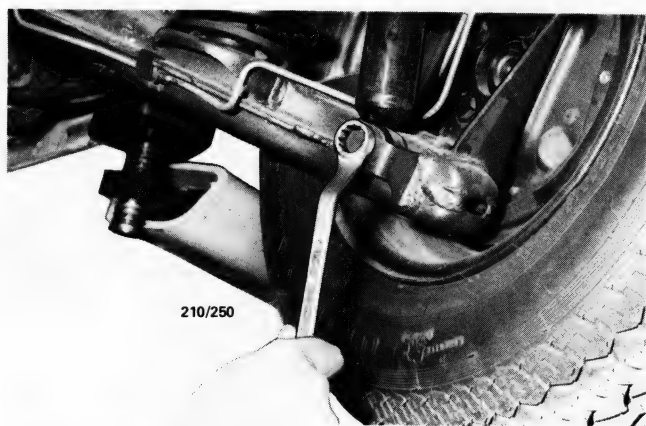
(2) Loose or broken stabiliser bar: Tighten or renew as necessary.

(3) Loose axle assembly pivot bolts or nuts: Check and tighten components.

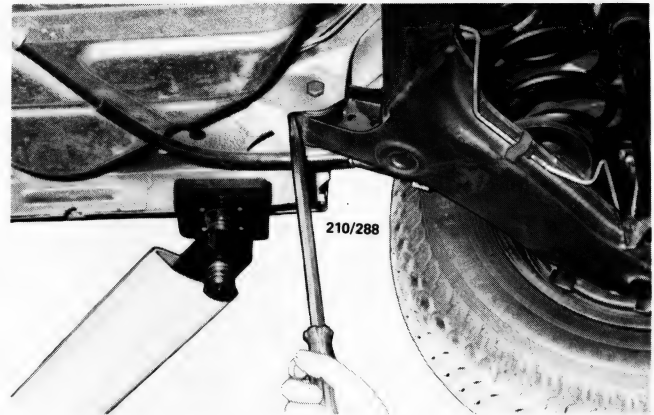
(4) Worn suspension bushes: Renew faulty components.

(5) Incorrect wheel and tyre balance: Balance wheels and tyres.

(6) Broken coil spring: Renew coil spring, preferably in pairs.



Check the rear shock absorber mounting bolts for tightness.



Check the rear axle pivot bushes for wear.

(7) Worn rear hub bearings: Check and renew the hub bearings as necessary.

NOTE: As a quick guide to shock absorber condition, bounce the vehicle up and down (one side at a time) and observe if the vehicle comes to rest in a single movement. If the vehicle bounces two or three times before coming to rest the shock absorber is suspect. If suspect, remove the shock absorber and check for fractures and leaks. If the shock absorber is found to be unserviceable it is good practice to instal two new shock absorbers as a matching pair.

To check the axle assembly bushes or pivot bolts, insert a lever between the suspect unit and its mounting and lever the unit back and forth checking for excessive movement.

Check the coil springs visually for breaks. If the spring is found to be unserviceable it is good practice to instal two new coil springs as a matching pair.

Rear hub bearing noise can be diagnosed by raising and supporting the rear of the vehicle then spinning one wheel at a time and listening for a rumble.



Rear hub bearing noise can be diagnosed by spinning one wheel at a time and listening for a rumble.

POOR OR ERRATIC ROAD HOLDING ABILITY

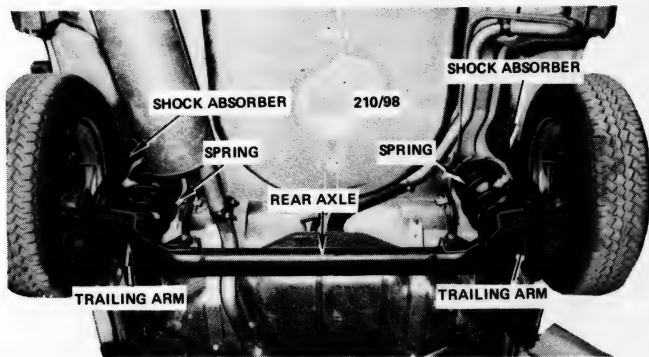
- (1) Low or uneven tyre pressures: Inflate to recommended pressures.
- (2) Defective shock absorber: Renew faulty shock absorber preferably in pairs.
- (3) Loose or broken stabiliser bar: Check and tighten or renew faulty component.
- (4) Worn suspension bushes: Renew faulty components.
- (5) Loose rear hub bearings: Check and adjust rear hub bearings.

NOTE: Check the serviceability of the shock absorbers and the rear axle bushes and pivot bolts as previously described.

If incorrect rear wheel alignment is suspected check for worn or damaged suspension components and have the wheel alignment checked by an authorised dealer.

2. DESCRIPTION

The rear suspension consists of a rear axle assembly with integral trailing arms. The assembly is mounted to the body in two positions via rubber bushes and pivot bolts. The stub axles are mounted directly to brackets on the axle assembly.



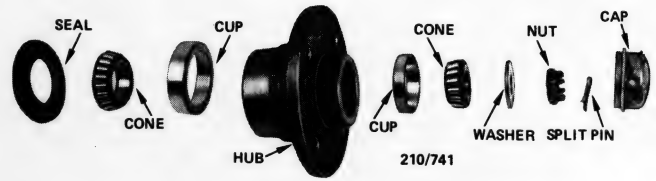
Underbody view of the rear of the vehicle showing the installed locations of the rear suspension components.

The coil springs are mounted between the trailing arms and the vehicle body and are seated at the top and bottom on rubber insulators. The hydraulic shock absorbers are mounted to the vehicle body and the rear of the trailing arms.

A stabiliser is fitted into the hollow section of the axle assembly and supported between its outer mounting points by a rubber damper.

3. REAR HUB**TO REMOVE AND DISMANTLE**

- (1) Raise the rear of the vehicle and support it on chassis stands. Refer to the Wheels and Tyres section for the correct procedure.



Dismantled view of rear hub assembly.

- (2) Suitably mark the road wheel in relation to the rear hub to aid assembly and remove the road wheel.
- (3) Remove the brake drum locating screw and withdraw the brake drum from the hub. If necessary refer to the Brakes section.
- (4) Using a suitable lever remove the hub grease cap from the rear hub.
- (5) Withdraw the split pin from the stub axle and remove the hub retaining nut and washer.
- (6) Withdraw the hub assembly from the stub axle taking care to collect the outer bearing cone.
- (7) Withdraw the inner bearing cone and grease seal from the stub axle.
- (8) If it is necessary to replace the stub axle, remove the four bolts retaining the stub axle to the flange on the axle assembly. Tap the stub axle with a soft faced hammer to separate it from the flange. The stub axle retaining bolts are micro-encapsulated and must be replaced with new bolts on assembly.

NOTE: If the hub bearings are being removed for repacking only, it will not be necessary to remove the inner and outer bearing cups as described in the following operation.

- (6) Suitably support the hub assembly and using a soft drift, tap the inner and outer bearing cups out of the hub. The inner bearing cup is removed from the inner end of the hub and the outer bearing cup from the outer end of the hub.
- (7) Remove all the old grease and wash all the components in a suitable cleaning solvent.

NOTE: Do not spin the bearings with compressed air as damage to the wheel bearings and/or injury to the operator may result.

- (8) Check the bearing rollers and cups for wear, pitting and damage and renew as necessary.

NOTE: Individual components of bearings should not be renewed separately. If any part of a bearing is faulty the complete bearing must be renewed.

TO ASSEMBLE AND INSTALL

Assembly and installation is a reversal of the removal and dismantling procedure with attention to the following points:

- (1) Using a soft drift, instal the inner and outer



Pack the wheel bearings by thoroughly working grease between the rollers, the inner race and the roller cage.

bearing cups in the hub with their tapers opposed to each other.

(2) Pack the hub bearings by thoroughly working a non-soap type wheel bearing grease between the rollers, the inner race and the roller cage.

(3) If necessary instal the stub axle to the axle assembly and torque the new retaining bolts to Specifications.

(4) Fit the inner bearing grease seal to the stub axle and apply a smear of grease to the hub contact face of the seal.

(5) Fit the inner bearing cone to the stub axle and the outer bearing cone to the hub assembly.

(6) Slide the hub assembly onto the stub axle and instal the washer and hub retaining nut.

(7) Tighten the retaining nut to 25 Nm while turning the hub assembly to seat the bearings in the hub. Release the nut until the hub washer can just be moved using the blade of a screwdriver. If the split pin hole in the stub axle and retaining nut do not align, release the nut until the first slot in the nut is correctly aligned with the split pin hole. Instal a new split pin and fit the grease cap to the hub assembly.

4. SHOCK ABSORBER

TO REMOVE AND INSTAL

(1) Run the rear of the vehicle onto car ramps, apply the handbrake and chock the front wheels.

(2) Working inside the luggage compartment remove the plastic cover from the upper shock absorber mounting.

(3) Remove the nut securing the piston rod of the shock absorber to the upper body mounting.

(4) Remove the washer and the rubber mounting bush from the piston rod.



Dismantled view of rear shock absorber assembly.

(5) Working beneath the vehicle, remove the lower shock absorber mounting bolt. Use a suitable lever to prise the lower end of the shock absorber from its mounting bracket and remove it from the vehicle.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Bleed the shock absorber as described under To Test and Bleed prior to installation and keep the shock absorber in an upright position during installation.

(2) Tap the lower end of the shock absorber into its mounting bracket using a soft faced hammer.

(3) Use a suitable drift placed through the shock absorber mounting and bush, to align the mounting bolt hole.

(4) Ensure the hole is aligned, gently tap the mounting bolt into position and tighten the bolt to Specifications.

(5) Ensure that the mounting washer and stepped bush are correctly located on the upper end of the piston rod.

(6) Extend the shock absorber and locate the piston rod in the upper mounting hole. Fit the upper mounting bush and washer and tighten the retaining nut to Specifications.

(7) Instal the plastic cover to the upper shock absorber mounting.

TO TEST AND BLEED

The extent to which a shock absorber can be tested without special equipment is limited to the following:

(1) Check the body of the shock absorber for dents, damage and fluid leaks. The shock absorber can not be repaired and should be renewed if found to be defective.



Check for defective shock absorber operation.

- (2) Check the rubber bushes and grommets for wear and deterioration. Renew as necessary.
- (3) Mount the shock absorber upright in a vice by the lower mounting eye.
- (4) Grasp the upper half of the shock absorber, pull up to the fully extended position and then slowly push down until the shock absorber is fully compressed.
- (5) Repeat operation (4) six to eight times to remove any slack spots caused by air in the system. If slack spots exist and can not be removed by this method, the shock absorber is evidently defective and should be renewed.

NOTE: If one shock absorber is found to be unserviceable, it is a good practice to instal two new shock absorbers as a matching pair.

SUPERLIFT SHOCK ABSORBERS

Optional shock absorbers with built in pressurised air bags assisting the springs can be fitted to all models.

The air bags in both shock absorbers are inflated from a common tee valve, the pressure depending on the load of the vehicle. The valve assembly is situated in the luggage compartment.

To Remove

- (1) Loosen the air pipe at the shock absorber and let the air escape.
- (2) Remove the fitting and the air pipe from the shock absorber and remove the shock absorber from the vehicle as previously described for standard type shock absorbers.

To Test and Bleed

Superlift shock absorbers are tested in the same manner as conventional shock absorbers.

When the shock absorber is extended and compressed, air will flow through the pipe connector as a result of the movement in the airbag.

To Instal

- (1) Instal the shock absorber as previously described for standard type shock absorbers.
- (2) Connect the air pipe and tighten the fittings.
- (3) Inflate the shock absorber air bags to the pressure specified by the manufacturer for the load condition of the vehicle.

Check the air pipes, connections and shock absorbers for air leaks. This can be done with soapy water brushed onto the components.

5. COIL SPRING

- (1) Raise the rear of the vehicle and support it on chassis stands. Refer to the Wheels and Tyres section for the correct procedure.
- (2) Place a suitable jack beneath the rear of the axle assembly adjacent to the lower shock absorber mounting. Raise the jack until the coil spring pressure is supported by the jack and there is no weight on the shock absorber.
- (3) Remove the lower shock absorber mounting bolt. Use a suitable lever to prise the shock absorber from its mounting bracket. Push the shock absorber up towards its upper mounting bracket until it is fully depressed.
- (4) Carefully lower the jack from beneath the shock absorber mounting to take the tension off the coil spring.
- (5) Insert a suitable lever through the shock absorber



Rear spring and insulators removed from vehicle.

ber lower mounting bracket. Pull down on the lever and remove the coil spring.

(6) Remove the rubber insulators from the body mounting and the axle assembly.

Installation is a reversal of the removal procedure with attention to the following points:

NOTE: If one coil spring is found to be unserviceable, it is good practice to instal two new coil springs as a matching pair.

(1) Ensure the rubber insulators are serviceable and fit them to their positions on the axle assembly and body.

(2) Use the lever to pull down on the axle assembly and place the coil spring in position.

(3) Raise the axle assembly with the jack until the shock absorber can be fitted to its lower mounting.

(4) Fit and tighten the shock absorber mounting bolt to Specifications.

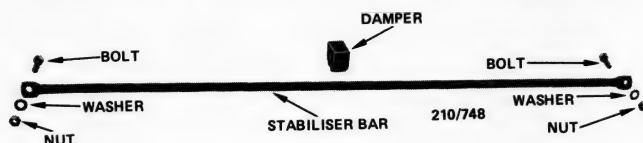
(5) Lower the vehicle to the ground.

6. STABILISER BAR

TO REMOVE AND INSTAL

(1) Raise the rear of the vehicle and support it on chassis stands. Refer to the Wheels and Tyres section for the correct procedure.

(2) Suitably mark the road wheels in relation to the rear hubs to aid assembly and remove the wheels.



Stabiliser bar removed from rear axle assembly.

(3) Mark the installed position of the rubber damper fitted to the stabiliser bar and withdraw it from the bar.

(4) Remove the nuts and bolts retaining each end of the stabiliser bar to the axle assembly. Take care not to lose the handbrake cable retaining brackets.

(5) Using a soft drift and a hammer drive the stabiliser bar from the axle assembly.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Slide the stabiliser bar inside the rear axle assembly and instal the rubber damper on the bar as marked prior to removal.

(2) Instal the stabiliser bar retaining bolts and nuts and torque the bolts and nuts to Specifications.

(3) Fit the road wheels ensuring the marks made on removal are aligned and tighten the wheel bolts as much as possible.

(4) Lower the vehicle to the ground and tighten the wheel bolts securely.

7. REAR AXLE ASSEMBLY

TO REMOVE AND INSTAL

(1) Raise the rear of the vehicle and support it on chassis stands. Refer to the Wheels and Tyres section for the correct procedure.

(2) Remove the road wheels after suitably marking them in relation to the hub assemblies to aid installation.

(3) Note the distance that the front handbrake cable adjusting thread protrudes through the locknut. Remove the locknut and adjusting nut.

(4) Release the handbrake outer cable from the brackets at each side of the exhaust mounting, the clips at the fuel tank straps and the brackets on the trailing arms.

(5) Remove the rubber insulators from the exhaust mounting brackets to allow the handbrake cable to be withdrawn over the exhaust system as the axle assembly is removed.

(6) Disconnect the rear brake hydraulic pipes at the brackets on each side of the axle assembly and remove the clips securing the flexible brake hoses to the brackets. Plug the hoses and pipes to prevent the loss of fluid and the ingress of dirt.

(7) Remove the shock absorbers and coil springs as previously described.

(8) Place a suitable jack beneath the centre of the axle assembly so that it just supports the weight of the axle. Protect the head of the jack with a rubber pad to avoid damage to the axle assembly.

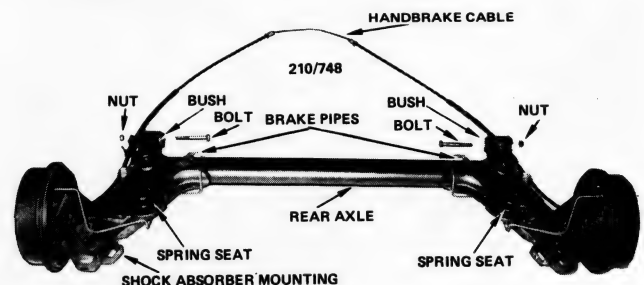
(9) Remove the axle assembly pivot bolt nuts and withdraw the pivot bolts and handbrake cable brackets.

(10) With the axle assembly supported on the jack withdraw the assembly rearwards at the same time guiding the handbrake cable from above the exhaust system.

(11) If the axle assembly is to be dismantled refer to the appropriate sections for removal of the individual components.

(12) Check the axle assembly pivot bushes for wear or deterioration, and replace as necessary.

NOTE: Special tools are required to remove and instal the axle assembly pivot bushes. Therefore it is recommended that replacement of these bushes be carried out by an authorised dealer.



View of the rear axle assembly removed from the vehicle.

Installation is a reversal of the removal procedure with attention to the following points:

- (1) Place the axle assembly on a jack and guide the handbrake cable over the exhaust system.
- (2) Raise the assembly until the pivot bushes are aligned with the body mountings.
- (3) Instal the pivot bolts and the handbrake cable retaining brackets and fit new self locking nuts finger tight.
- (4) Instal the coil springs and shock absorbers as previously described.
- (5) Remove the plugs from the brake hoses. Instal the flexible brake hose to the mounting brackets and instal the retaining clips.
- (6) Connect the brake pipes to the brake hoses and tighten the unions securely.

(7) Bleed the brake hydraulic system as described in the Brakes section.

(8) Instal the rear handbrake cable to its retaining clips, connect the equaliser to the front cable and instal the locknuts according to the distance noted on removal.

(9) Fit the road wheels ensuring the marks made on removal are aligned, lower the vehicle to the ground and tighten the wheel bolts securely.

(10) Bounce the vehicle several times to ensure the suspension has settled to its correct position.

(11) Tighten the axle assembly pivot bolt nuts to Specifications.

(12) Check the handbrake adjustment and if necessary refer to the Brakes section for the correct adjusting procedure.

SPECIFICATIONS

Type:

Front	Disc
Rear	Drum

Operation:

Foot brake	Vacuum servo assisted hydraulic, diagonally split
-----------------	--

Handbrake	Mechanical on rear wheels
-----------------	---------------------------

Front brakes:

Brake disc -	
Diameter	236 mm
Run out limit	0.03 mm
Thickness	12.7 mm

Caliper -

Type	Single piston, sliding
Bore diameter	54 mm

Rear brakes:

Brake drum -	
Inner diameter	230 mm
Machining limit	230.185 mm

Wheel cylinder -

Bore diameter	20.6 mm
Piston to bore clearance	0.13 mm

Master cylinder:

Type	Tandem
Bore diameter	20.64 mm

TORQUE WRENCH SETTINGS

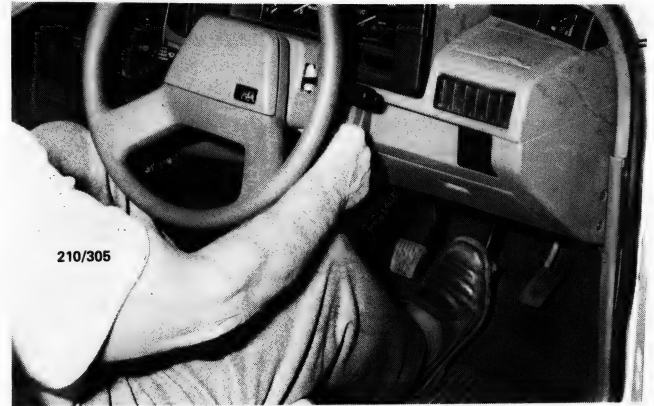
Caliper anchor plate retaining bolts	85 Nm
Caliper to guide pin retaining bolts	43 Nm
Wheel cylinder retaining bolts	11 Nm
Master cylinder spool bore plug	45 Nm
Master cylinder retaining nuts	14 Nm
Caliper brake hose retaining bolt	37 Nm
Brake servo unit retaining nuts	20 Nm

1. BRAKES TROUBLE SHOOTING

BRAKE PEDAL HARD

- (1) Incorrect brake pads or shoe linings fitted: Check and replace with the recommended type.
- (2) Restricted brake line from master cylinder: Check brake lines and remove restriction or renew line.
- (3) Frozen wheel cylinder or caliper pistons: Check, free up or renew pistons.
- (4) Vacuum servo system inoperative: Check servo system and rectify.
- (5) Frozen pedal pivot: Rectify or renew pivot bolt.

NOTE: The vacuum servo system can be checked out as follows: With the engine switched off, pump the brake pedal several times to deplete any vacuum in the system.



Checking the vacuum servo system.

With the engine still switched off press down firmly on the brake pedal and hold it there, noting the position and pressure required. Holding down on the brake pedal, start the engine. If the vacuum servo unit is operating correctly the brake pedal will sink slightly and the pressure required to hold it may even reduce. If the pedal does not sink slightly when the engine is started then the vacuum servo unit can be considered inoperative.

BRAKE DRAG

- (1) Clogged master cylinder ports: Check and clean master cylinder and fluid reservoir.
- (2) Frozen wheel cylinder or caliper pistons: Check, free up or renew pistons.
- (3) Frozen handbrake cable: Free up or renew cable.
- (4) Broken or stretched brake shoe return springs: Renew defective springs.
- (5) Blocked vent in fluid reservoir cap: Check vent and remove obstruction.

NOTE: To check out this condition jack up the vehicle, support on chassis stands and spin all wheels to check for binding.



Spin each wheel by hand to check for binding brakes.

If the wheels are not binding have an assistant apply and release the brakes. Check if the brakes are immediately releasing. A clogged master cylinder port will cause binding on the two wheels fed by that particular circuit from the master cylinder. Open the bleeder valve on one of the offending wheels to check if pressure build up is the cause for binding. A frozen handbrake cable will usually cause binding on both rear wheels. To check out this condition disconnect the handbrake cable at or as close to the rear backing plates as possible and check if the wheels will then turn freely.

LOW SPONGY BRAKE PEDAL

- (1) Inoperative rear brake self adjuster system: Free off or renew self adjuster as necessary.
- (2) Lack of sufficient fluid in system: Check for leaks, replenish fluid to specified level and bleed brake system.
- (3) Air in brake hydraulic system: Bleed hydraulic system.

NOTE: A spongy brake pedal in most cases is caused by air in the hydraulic system. For air to enter the system one or more of the sealing rubbers or pipes must be sucking in air. Always rectify the cause of the trouble before bleeding the brake system. Faulty components usually show up as fluid leakage.

BRAKES LOCK ON APPLICATION

- Inoperative rear brake self adjuster system: Free off or renew self adjuster as necessary.
- (2) Cracked or eccentric brake disc or drum: Check and renew as necessary.
 - (3) Incorrect brake linings or pads fitted: Renew with recommended type.
 - (4) Broken or stretched brake shoe return springs: Check and renew as necessary.



Check the brake linings for excessive wear and contamination.

(5) Brake lining grabbing: Chamfer leading and trailing edges of shoes.

(6) Loose brake backing plate and/or wheel cylinder: Check and tighten securely.

(7) Worn or gummy linings or pads due to contamination by oil or brake fluid: Check for leakage and repair, renew pads and/or linings as necessary.

(8) Rear brakes only are locking: Check operation of pressure proportioning valve and renew or overhaul master cylinder as necessary.

NOTE: If this condition arises, first remove all wheels and check the condition of the friction material both for oil contamination and excessive wear. Check the shoe return springs for stretching by comparing their free length with new springs. A bent or eccentric brake drum will be indicated by pulsating on the brake pedal when the brakes are lightly applied.

BRAKE PEDAL PULSATES

- (1) Bent or eccentric brake drum or disc: Check and renew drums or discs as required.
- (2) Loose or worn front or rear hub bearings: Tighten, adjust or renew hub bearings.

NOTE: Check the hub bearings as outlined in the Front or Rear Suspension sections. Brake drums or discs that prove to be running out must be machined. This job is best entrusted to a brake specialist who will also be able to determine if a new disc or drum needs to be fitted.

BRAKE FADE

- (1) Malfunction of the rear brake self adjuster: Repair or renew self adjuster as necessary.
- (2) Eccentric or bent brake drum: Check and renew faulty component.
- (3) Linings saturated with hydraulic fluid: Renew contaminated linings.
- (4) Incorrect linings fitted: Check and install recommended linings in sets.
- (5) Contaminated brake fluid: Drain, flush, refill and bleed hydraulic system.

NOTE: In most cases brake fade is caused by overuse of the foot brake, which in turn causes a build up of heat at the friction material and drums or discs. Once this excessive build up of heat is allowed to dissipate the brakes should again function normally.

BRAKES OVERHEAT

- (1) Malfunction of the rear brake self adjuster: Repair or renew self adjuster as necessary.

- (2) Broken shoe return springs: Renew faulty springs.
- (3) Faulty handbrake cables and/or adjustment: Check cables, renew or adjust.
- (4) Frozen wheel cylinder or caliper piston: Free up or renew faulty components.
- (5) Obstructed or damaged hydraulic hose or line: Remove obstruction or renew hydraulic hose or line.
- (6) Obstructed master cylinder compensating port: Clear compensating port.
- (7) Blocked vent in master cylinder reservoir cap: Check and remove obstruction in vent.
- (8) Overuse of foot brake: Revise driving habits.

NOTE: To check for brake binding raise the vehicle and spin each wheel in turn by hand. If it is found that one wheel cylinder piston is sticking then it is advisable to overhaul all wheel cylinders including the master cylinder.

BRAKE FAILURE

- (1) Faulty master cylinder: Remove and overhaul master cylinder.
- (2) Loss of fluid due to leaking wheel cylinder: Overhaul or renew wheel cylinders and bleed hydraulic system.
- (3) Loss of fluid due to leaking caliper: Overhaul or renew caliper assembly and bleed hydraulic system.
- (4) Loss of fluid due to fractured pipe and/or faulty union: Renew faulty components as necessary and bleed hydraulic system.
- (5) Air in hydraulic system: Locate source of air leak and rectify. Bleed hydraulic system.
- (6) Contaminated brake Fluid: Drain, flush, refill and bleed hydraulic system.

NOTE: To locate the source of a fluid leak, refill the master cylinder reservoir with fluid and have an assistant pump the brake pedal whilst checking for obvious signs of external leakage, prior to dismantling and overhauling the braking system.

BRAKE NOISE

- (1) Brakes squeal on application: Glazed friction material. Remove and inspect brake pads, deglaze friction material with emery paper.
- (2) Grinding noise on application: Friction material worn out. Inspect friction material, discs and drums. Renew brake shoes or pads. Machine or renew brake discs or drums.
- (3) Incorrectly adjusted rear hub bearings: Check and adjust hub bearings.

NOTE: Brake squeal in most cases is caused by the friction material on the brake pads becoming glazed.

Unsuitable friction material or the omis-

sion of anti rattle springs may also cause brake noise.

If the brake pads or brake shoes are worn to metal always renew either the brake shoes or brake pads as a complete set of four. The brake drum or brake disc will have to be machined or renewed otherwise braking efficiency will be impaired.

2. DESCRIPTION

The brakes are applied by hydraulic pressure in two independent circuits by means of a tandem dual circuit master cylinder. The circuits are split diagonally, the left hand front and the right hand rear brakes are connected in one circuit while the right hand front and the left hand rear brakes are connected in the other circuit. Should a malfunction occur in one circuit, the remaining circuit is capable of stopping the vehicle safely.

The four wheel hydraulically operated brakes utilise leading and trailing brake shoes on each rear wheel and disc brakes on each front wheel.

The leading and trailing shoe type brakes on the rear wheels use a double ended wheel cylinder to operate both brake shoes. The other part of each shoe abuts an anchor arrangement on the backing plate. The shoes are automatically adjusted.

On all models a vacuum servo unit is installed between the master cylinder and the bulkhead.

The front disc brakes comprise of a disc attached to the wheel hub and a caliper assembly attached to the steering knuckle.

The caliper is of the sliding type. As pad wear takes place, the caliper piston is allowed to slide outward through the seal to take up a new position in the caliper bore. When the brakes are in the off position, a constant clearance is maintained between the pads and the disc. Elastic deformation of the piston seal on the piston takes place when the brakes are applied and returns the piston to its normal off position when the brakes are released.

The disc brakes do not require periodical adjustment in service to compensate for pad wear as they are self-adjusting.

The dual circuit master cylinder incorporates fluid pressure proportioning valve assemblies and a fluid pressure differential warning lamp assembly.

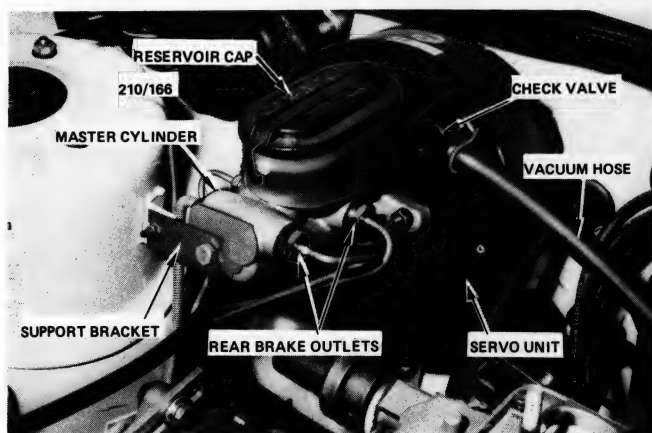
A proportioning valve is installed into each rear brake outlet. These proportioning valves are designed to prevent premature locking up of the rear wheels during severe braking.

In the case of a loss in pressure in any part of the hydraulic system, caused by leaking wheel cylinder cups, leaking flexible hoses, chafed brake lines, etc., the switch on the valve unit comes into operation and causes a warning lamp on the instrument panel to light. After the fault has been rectified and the hydraulic system has been bled, the switch will readjust itself and the warning lamp on the instrument panel will go out.

3. MASTER CYLINDER

TO REMOVE

- (1) Raise the engine bonnet and fit fender covers to both front fenders.
- (2) Disconnect the wire connector from the brake warning lamp switch.
- (3) Remove the nut, the washer and the bolt retaining the master cylinder support bracket to the master cylinder and to the vehicle body respectively.
- (4) Disconnect the brake fluid pipes from the outlets on the master cylinder and plug all pipes to prevent entry of dirt and fluid spillage.
- (5) Remove the nuts securing the master cylinder to the brake servo unit and remove the master cylinder assembly.

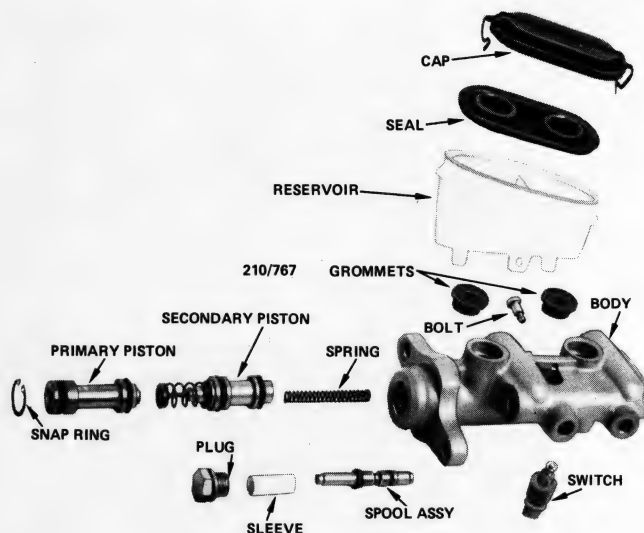


Installed view of brake master cylinder.

NOTE: Care should be exercised when removing or installing the master cylinder assembly to ensure that brake fluid is not permitted to drop onto the surrounding paint-work of the vehicle. Brake fluid, if accidentally spilt should be immediately washed away with water and then allowed to dry naturally and not wiped with a cloth.

TO DISMANTLE

- (1) Unclip the reservoir cap and remove the cap and seal from the reservoir. Drain the brake fluid from the reservoir.
- (2) Remove the bolt retaining the reservoir to the master cylinder body and remove the reservoir and the two reservoir sealing grommets from the cylinder body.
- (3) Using suitable snap ring pliers, remove the snap ring from the master cylinder bore and withdraw the primary piston and seals from the cylinder bore.
- (4) If a genuine master cylinder repair kit is being used, open up the repair kit and take out the plastic ring. Using a Stanley knife or similar sharp tool cut the ring and instal the ring into the snap ring groove in the master cylinder bore.



Dismantled view of brake master cylinder.

NOTE: If the special plastic ring is not supplied or is unavailable, use a suitable alternative. The purpose of installing the plastic ring to the snap ring groove is to prevent the secondary piston seal lip slipping into the snap ring groove and thus make removal of the secondary piston assembly difficult.

- (5) Carefully remove the secondary piston assembly from the cylinder bore by tapping the rear of the cylinder body on a block of wood and allowing the secondary piston assembly to be dislodged from the cylinder bore. Do not pull on the secondary piston caged spring in order to withdraw the piston from the cylinder.
- (6) Withdraw the secondary piston return spring from the cylinder bore and the plastic ring from the snap ring groove.
- (7) Remove the brake warning lamp switch from the cylinder body.
- (8) Remove the plug and sealing washer from the rear of the spool bore.
- (9) Tap the rear of the master cylinder bore gently on a block of wood and allow the spool sleeve to become dislodged from the spool bore.
- (10) Grasp the end of the spool using long nose pliers and withdraw the spool assembly from its bore. Remove the 'O' ring and washer from the rear of the spool and the 'O' ring from the front of the spool.
- (11) Only if the pistons are to be reused, cut the piston seal plastic retainers with a sharp knife and remove the piston seal retainers and the piston seals from the pistons using a blunt instrument. Ensure that the pistons are not damaged during this operation.
- (12) If a major repair kit is not used, do not remove the fluid pressure proportioning valve assemblies from the master cylinder outlet ports, as once removed they are unserviceable. If the valve assemblies are to be renewed remove the valve assemblies as follows:
 - (a) Using suitable snap ring pliers remove the snap

rings from each of the rear outlet ports of the cylinder body. Discard the snap rings.

(b) Instal a suitable easy-out or self tapping screw into the valve assemblies outlet hole and pull the valve assemblies out of their respective bores.

TO CLEAN AND INSPECT

(1) Wash all components thoroughly in clean methylated spirits. Do not use petrol, kerosene or other cleaning solvents.

(2) Check the cylinder bore for wear, scoring or pitting. Do not hone the master cylinder bore. If the bore is pitted or worn renew the master cylinder assembly as an assembly.

(3) Ensure that all the inlet and compensating ports between the reservoirs and the cylinder bore are free of any obstruction. Use compressed air to clear master cylinder compensating ports. Do not use wire.

(4) Check the pistons and the spool and sleeve for signs of scoring, corrosion or wear.

TO ASSEMBLE

Assembly is a reversal of the dismantling procedure with attention to the following points:

(2) Liberally lubricate the cylinder bores and all internal parts, but NOT the proportioning valve assemblies, with clean brake fluid.

(3) Instal the secondary seal with the single seal lip into the secondary piston groove closest to the caged spring and with the seal lip towards the caged spring.

NOTE: Two primary seals and two secondary seals are used on the pistons. The two primary seals are identical and are identified by six small grooves around the outer circumference. The two secondary seals are not identical. The secondary seal to be installed to the secondary piston has a single seal lip and six small protrusions around the underside of the seal lip. The secondary seal to be installed to the primary piston has two seal lips and no protrusions.

(4) Instal one of the two identical primary piston seals into the second groove of the secondary piston with the seal lip facing away from the caged spring.

(5) Instal a seal plastic retainer to the front end of the primary piston seal. Engage the retainer to the retainer groove and, using a small blunt instrument, push the retainer completely into the groove. Take care not to damage the piston seal on the piston.

(6) Instal the secondary seal with the double seal lip into the primary piston groove closest the pushrod end of the piston with the seal lip facing away from the pushrod end of the piston.

(7) Instal the remaining primary seal into the second groove of the primary piston with the seal lip facing away from the pushrod end of the primary piston.

(8) Instal the second piston seal retainer to the retainer groove in front of the primary seal in the same manner as described in operation (5).

(9) Slide the secondary piston return spring into the end of the secondary piston and carefully instal the piston assembly, return spring first, into the bottom of the master cylinder bore.

NOTE: Take care when handling the caged spring on the secondary piston as the spring is factory set to a predetermined length.

(10) Carefully instal the primary piston assembly small end first into the master cylinder bore. Using a suitable blunt tool push the piston assemblies into the cylinder bore until the primary piston is past the snap ring groove at the rear of the cylinder bore. Instal a new piston retaining snap ring into its groove then release the pressure on the primary piston.

(11) If the proportioning valve assemblies were removed from the cylinder outlet ports, lubricate the valve bores on the master cylinder with clean brake fluid.

Instal a proportioning valve assembly into each of the master cylinder large outlet ports with the cone seat facing outwards. Using finger pressure only, push the valve assemblies fully into their seats taking care not to damage the valve assembly 'O' rings.

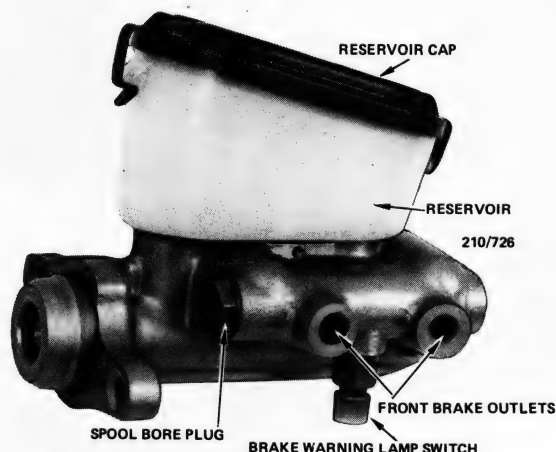
Ensuring that the valve assemblies are fully pushed into their bores, instal new snap rings making sure the snap rings are seated correctly against the square shoulders of the valve assemblies and secure in the thread.

(12) Lubricate the spool bore with clean brake fluid.

(13) Instal the smaller 'O' ring to the front groove of the spool and the larger 'O' ring and washer to the rear, with the washer against the spool shoulder. Instal the spool assembly into the spool bore, short end first.

(14) Instal the spool bore plug with a new sealing washer and tighten to Specifications.

(15) Instal and tighten the brake warning lamp switch to the underside of the cylinder body.



View of brake master cylinder removed from vehicle.

- (16) Place the reservoir sealing grommets into the apertures on top of the master cylinder body.
- (17) Place the reservoir outlet tubes into the sealing grommets and instal and tighten the reservoir retaining bolt.
- (18) Instal a new seal and diaphragm assembly to the reservoir cap.
- (19) Instal the master cylinder to the vehicle as later described.

TO INSTAL

Installation is a reversal of the removal procedure with attention to the following points:

- (1) Pour a small amount of new brake fluid into the reservoir and pump the piston assemblies with a suitable blunt rod until fluid begins to emerge from the cylinder outlets.
- (2) Loosely instal the master cylinder to the brake servo unit.
- (3) Loosely instal the brake pipes ensuring that the pipe union nuts are not cross threaded.
- (4) Securely tighten the nuts retaining the master cylinder to the brake servo unit to Specifications.
- (5) Securely tighten the brake fluid lines union nuts on the master cylinder.
- (6) Fit and tighten the support bracket to the master cylinder and to the vehicle body.
- (7) Connect the wire to the brake warning lamp switch.
- (8) Bleed the brakes as described under the heading Hydraulic System - To Bleed.

4. FRONT WHEEL DISC BRAKES

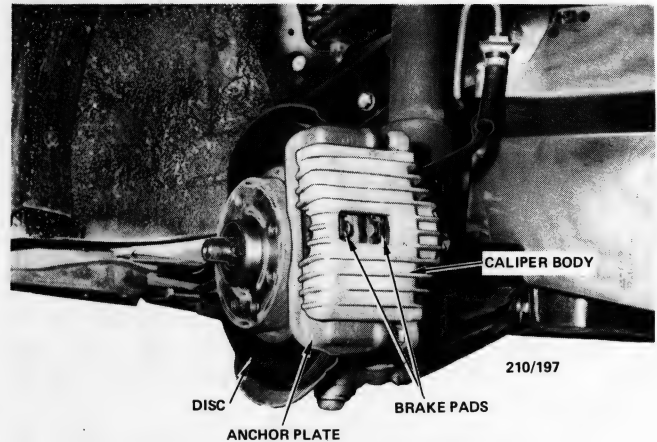
Special Equipment Required:

To Check Brake Disc Runout - Suitable dial gauge

TO RENEW BRAKE PADS

- (1) Mark the installed position of the front road wheels in relation to the front wheel hubs and loosen the road wheel retaining bolts.
- (2) Raise the front of the vehicle and support on chassis stands as described in the Wheels and Tyres section. Remove the front road wheels.
- (3) Drain approximately two-thirds of the brake fluid from the master cylinder reservoir. This can be done by loosening the relevant brake line at the master cylinder and bleeding down the fluid into a container. Do not reuse this fluid.

NOTE: Do not completely remove the brake line or drain off all the fluid from the reservoir otherwise it will be necessary to bleed the hydraulic system. The fluid is drained from the reservoir to prevent overflow when the caliper piston is pushed back into its bore to facilitate pad renewal.



Installed view of front disc brake caliper.

Complete work on one caliper at a time and replace brake pads as sets of four.

- (4) Remove the bolts retaining the anchor plate to the steering knuckle and withdraw the caliper and anchor plate assembly from the steering knuckle.
- (5) Suspend or support the caliper and anchor plate assembly in such a manner that the assembly weight is not taken on the brake hose.
- (6) Using a suitable screwdriver lever the brake pads from the caliper piston and from the caliper body to break the glue bond. Remove the pads from the caliper body.
- (7) Ensure that the guide pins move freely in the anchor plate and that the dust covers are in good condition. Never lubricate the guide pins with mineral oil or grease, use only a silicone type grease.
- (8) Check the caliper for fluid leaks and the dust seals for deterioration. Overhaul the caliper if necessary.
- (9) Using a suitable solvent such as trichloroethylene, clean the brake pad contact surfaces on the caliper piston and on the caliper body. Remove all traces of old glue.
- (10) Apply a 0.5 mm thick coat of Beta Chemicals glue 'Contact No 27' or an equivalent to the rear of the pad backing plates where they come into contact with the caliper piston and the caliper body.
- (11) Instal the inner brake pad into the caliper body against the caliper piston. Ensure that the anti-rattle spring is paralled with the brake pad and with the open ends facing outwards.
- (12) By pressing on the brake pad by hand, push the caliper piston into the caliper bore until the brake pad is fully seated against the caliper body.
- (13) Instal the outer brake pad into the caliper body again ensuring that the anti-rattle spring is parallel with the brake pad and the open ends of the spring are facing outwards.
- (14) Place the outer brake pad firmly against the caliper body.

NOTE: Operations 11, 12, 13 and 14 need to be finalised before the glue starts to set solid.

(15) Instal the caliper and anchor plate assembly to the steering knuckle ensuring that the brake hose is not twisted.

(16) Instal the bolts retaining the anchor plate to the steering knuckle and tighten the bolts to Specifications.

(17) Pump the brake pedal a few times to bring the pads to their normal positions alongside the brake disc.

(18) Top up the master cylinder reservoir with the recommended brake fluid. Ensure the reservoir cap seal and diaphragm is positioned correctly in the reservoir cap.

(19) Instal the road wheels to the vehicle and lower the vehicle to the ground.

TO OVERHAUL CALIPER

(1) Mark the installed position of the front road wheels in relation to the front wheel hub, and loosen the front wheel retaining bolts.

(2) Raise the front of the vehicle and support on chassis stands as described in the Wheels and Tyres section. Remove the front road wheels.

(3) Disconnect the flexible brake hose from the caliper body. Plug the brake hose to prevent the loss of brake fluid and the entry of dirt.

(4) Remove the bolts retaining the anchor plate to the steering knuckle and remove the anchor plate and caliper assembly from the vehicle.

(5) With a suitable screwdriver lever the brake pads from the caliper piston and from the caliper body to break the glue. Remove the brake pads from the caliper body.

(6) Slide the anchor plate and the dust covers off the guide pins.

(7) If necessary, remove the bolts retaining the guide pins to the caliper body and remove the guide pins. Discard the guide pin retaining bolts.

(8) Place a piece of cloth in front of the piston and using a low air pressure applied to the hydraulic brake hose aperture, gently force the piston from the caliper bore.

NOTE: Excessive air pressure could cause the piston to eject with great force and cause injury to the operator or damage to the piston.

(9) Disengage the dust seal from its locating groove in the end of the caliper bore and remove it from the caliper.



Dismantled view of brake caliper and components.

(10) Using a thin blunt probe preferably made from wood or plastic, lift and remove the piston seal from its groove in the caliper bore.

(11) Remove the bleeder valve from the caliper.

(12) Clean all parts except the brake pads in methylated spirits and examine carefully for wear and corrosion. Renew any corroded, worn or doubtful parts. Discard the piston seal and the dust seal.

(13) Smear a new piston seal with clean brake fluid and instal it into the inner groove in the caliper bore. Ensure that the seal is not twisted and is correctly seated in the groove.

(14) Instal the outer lip of a new dust seal into the outer groove in the caliper bore ensuring that the lip fits correctly in the groove.

(15) Lubricate the outside of the caliper piston with clean brake fluid and instal the piston into the caliper bore.

(17) Using hand pressure only push the piston into its bore, at the same time instal the inner lip of the dust seal into the piston groove. Ensure the outer lip of the dust seal remains in its groove.

(16) If the guide pins were removed from the caliper, instal the guide pins and use new retaining bolts. Tighten the guide pin retaining bolts to Specifications.

(17) Lubricate the guide pins lightly with a silicone type grease. Instal the dust covers to the guide pins and slide the anchor plate onto the guide pins.

(18) Instal the bleeder valve to the caliper.

(19) Instal the brake pads to the caliper body and instal the caliper and anchor plate assembly to the steering knuckle as previously described.

(20) Instal the flexible brake hose to the caliper body using new washers. Ensure that the hose is not twisted and that the plug is removed from the hose.

(21) Top up the master cylinder reservoir with clean brake fluid and bleed the brakes as described under the heading Hydraulic System - To Bleed.

TO REMOVE AND INSTAL BRAKE DISC

(1) Mark the installed position of the road wheel in relation to the wheel hub and loosen the road wheel retaining bolts.

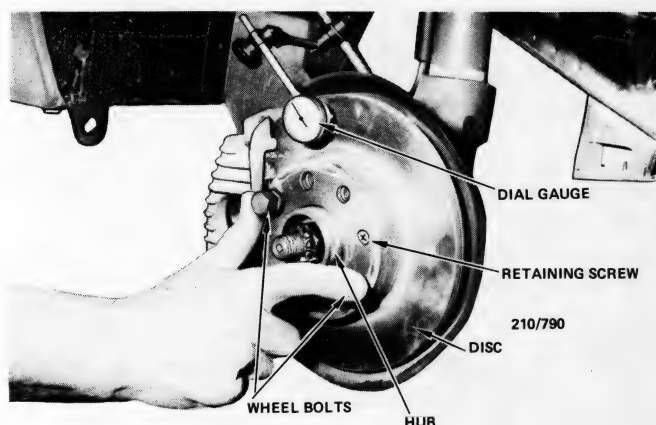
(2) Raise the front of the vehicle and support on chassis stands as described in the Wheels and Tyres section. Remove the road wheel.

(3) Remove the bolts retaining the caliper anchor plate to the steering knuckle and lift the caliper assembly off the disc.

(4) Support or suspend the caliper out of the way without stretching the brake hose.

(5) If a dial gauge is available, use two road wheel retaining bolts to tighten the brake disc to the wheel hub and check the run out of the disc. Position the tip of the dial gauge 10 mm from the disc outer edge. See Specifications for run out limit.

(6) Remove the screw retaining the brake disc to the wheel hub flange and withdraw the disc from the wheel hub.



Method of checking brake disc run out.

- (7) Clean the disc with a suitable solvent and examine for variation in thickness, flatness and scoring.

NOTE: If the disc does not meet Specifications, renew the disc. The disc should not be machined. As it is important for both discs to have the same surface finish to obtain equal braking performance on both front wheels, both discs should be renewed when any one disc is unserviceable.

Installation is a reversal of the removal procedure with attention to the following points:

- (1) Ensure that the mating surfaces on the disc and the wheel hub flange are clean and free from any burrs.
- (2) Instal the caliper and anchor plate assembly and tighten the retaining bolts to Specifications.
- (3) Depress the brake pedal to relocate the brake pads after installation.
- (4) Fit the road wheel, lower the vehicle to the ground and road test.

5. REAR BRAKE ASSEMBLY

TO REMOVE AND DISMANTLE

- (1) Chock the front wheels and loosen the rear road wheel retaining bolts on both sides.
- (2) Raise the rear of the vehicle and support on chassis stands as described in the Wheels and Tyres section. Remove the rear road wheels.
- (3) Remove the screw retaining the brake drum to the rear hub flange.
- (4) Release the handbrake lever and loosen off the lock and adjusting nuts on the handbrake relay rod.
- (5) Remove the brake drum from the rear hub.

NOTE: If the brake shoes foul the brake drum, thus preventing its removal, prise out the rubber plug from the rear of the backing plate and with a suitable screwdriver push the handbrake actuating lever outwards. This will allow the brake shoes to contract.

- (6) Clamp or tie the wheel cylinder pushrods in position so that they will not become dislodged.

- (7) Mark the brake shoes and the backing plate with a daub of quick drying paint to ensure correct assembly.

NOTE: Although it is not necessary to remove the wheel hub to overhaul the rear brakes, removal of the rear hub will facilitate operations. If so desired refer to the Rear Suspension section for the correct removal and installation procedures.

- (8) Remove the front brake shoe retaining clip by compressing the clip and turning the retaining pin 90 degrees.

- (9) Lever the lower return spring from behind the lower anchor point.

- (10) Disconnect the front brake shoe from the lower anchor point and then disconnect the lower return spring from both brake shoes.

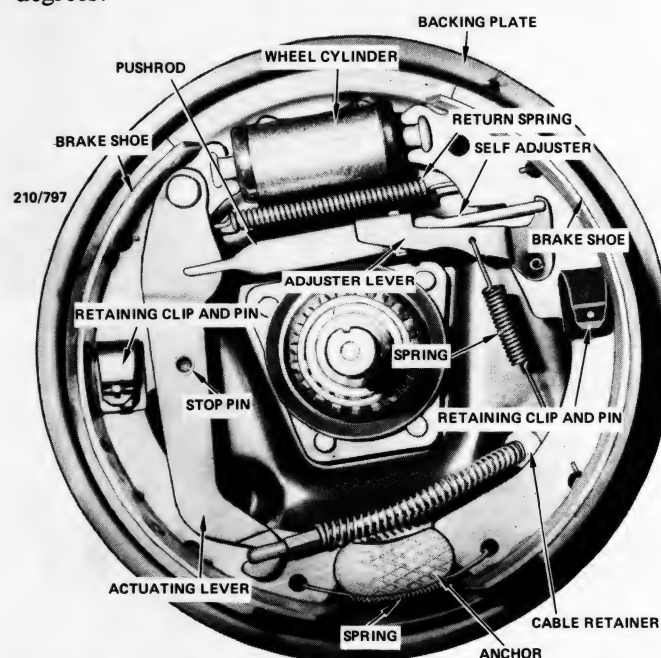
- (11) Unclip the adjuster lever from the self adjuster pushrod and disconnect the lever from the spring. Remove the adjuster lever from the front brake shoe pivot pin and the spring from the brake shoe.

- (12) Using a screwdriver through one of the holes in the hub flange, operate the ratchet wheel on the self adjuster until the ratchet wheel is completely retracted.

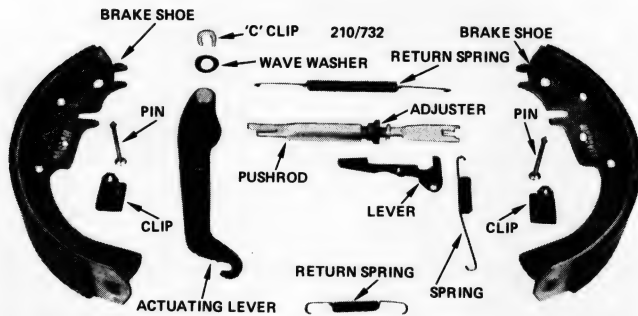
- (13) Lift up the bottom of the front shoe and remove the self adjuster and pushrod assembly.

- (14) Lever the top of the front shoe over the wheel cylinder pushrod and disconnect the upper return spring from the shoe.

- (15) Remove the rear brake shoe retaining clip by compressing the clip and turning the retaining pin 90 degrees.



Assembled view of right hand side rear brake assembly.



Dismantled view of right hand side rear brake assembly.

(16) Disconnect the handbrake cable from the handbrake actuating lever and remove the rear shoe from the backing plate. Remove the upper return spring from the shoe.

(17) If the brake shoes are to be renewed, open the 'C' clip and remove the handbrake actuating lever and dished washer from the rear brake shoe.

NOTE: It is recommended that the brake wheel cylinders are removed and overhauled when the rear brake shoes are renewed.

(18) Disconnect the hydraulic brake pipe at the wheel cylinder on the rear of the brake backing plate and plug the pipe to prevent the loss of brake fluid or the entry of dirt.

(19) Remove the bolts securing the wheel cylinder to the brake backing plate and remove the wheel cylinder from the vehicle. Remove the clamp from the wheel cylinder.

(20) Withdraw the rubber boots and the pushrods from each end of the wheel cylinder and take out the two pistons.

(21) Push the wheel cylinder cups, cup spacers and spring out of the cylinder bore.

(22) Unscrew and remove the wheel cylinder bleeder valve.

TO CLEAN AND INSPECT

(1) Clean all wheel cylinder components in methylated spirits and examine for wear.

NOTE: Once having dismantled a wheel cylinder, renew all rubber components.

(2) Check the pistons and inside the wheel cylinder bore for wear, corrosion or pitting. Clean up with very fine wet and dry rubbing paper.

If the above does not remove all the pitting in the cylinder bore, renew the wheel cylinder as an assembly.

NOTE: Clearance between pistons and cylinders should be within Specifications.

(3) Check the brake shoe linings for excessive wear. Renew shoe and lining assemblies subject to the following note.

(4) If the linings are still serviceable check for oil saturation or gumminess and renew as necessary.

NOTE: The lining and shoe assemblies must be renewed as pairs with the corresponding lining and shoe assembly on the other wheel.

(5) Check the brake drum for cracks, scoring or ovality and renew or regrind as necessary.

(6) Ensure there are no burrs on the backing plates where the shoes slide.

(7) Check the tension of the brake shoe springs by comparison with new springs and renew as necessary.

(8) Check that the self adjuster thread is not burred or damaged and turns freely by hand.

(9) Check the freeness of the handbrake cable.

TO ASSEMBLE AND INSTALL

Assembly is a reversal of the dismantling procedure with attention to the following points:

(1) Dip the internal components of the wheel cylinder in clean hydraulic brake fluid.



Dismantled view of rear wheel cylinder components.

(2) Instal a wheel cylinder cup in each end of the wheel cylinder bore with the lipped edges facing each other and the spacers and spring interposed between the two cups.

(3) Smear each piston with hydraulic brake grease and instal one in each end of the wheel cylinder bore with the flat face of the pistons to the flat face of the wheel cylinder cups.

(4) Instal a rubber boot and pushrod on each end of the wheel cylinder and instal the bleeder valve. Fit a clamp to hold the components in place.

(5) Fit the cylinder assembly to the backing plate and connect the brake pipe, then fit and tighten the bolts and washers to Specifications.

(6) Tighten the brake pipe and the bleeder valve.

(7) Ensure that the front and rear brake shoes are installed in their original positions.

(8) Lubricate all metal-to-metal contact surfaces with a light smear of zinc oxide grease.

(9) Ensure that the thread on the self adjuster is clean and free, and lubricate the assembly lightly with a lithium base grease.

(10) Fit the handbrake lever to the rear brake shoe.

(11) Hook the upper brake return spring to the hole in the rear shoe.

NOTE: The upper return spring is to be hooked in from the backing plate side of the brake shoe. The lower spring is to be hooked in from the brake drum side of the brake shoe. The self adjuster spring is to be hooked in at the bottom on the backing plate side and at the top on the brake drum side.

(12) Where removed, fit the handbrake actuating lever to the rear brake shoe and secure with the 'C' clip.

(13) Connect the handbrake cable to the handbrake actuating lever and hook the upper return spring to the rear brake shoe.

(14) Position the rear brake shoe on the backing plate and secure the shoe with the retaining clip and pin.

(15) Hook the front shoe to the upper return spring and lever the shoe over the wheel cylinder pushrod. Ensure that the pushrod is correctly seated in the slot of the shoe.

(16) Lift up the bottom of the front shoe and manoeuvre the self adjuster and pushrod behind the hub flange so that it is interposed between the handbrake actuating lever and the front brake shoe.

(17) Instal the self adjuster spring and lever. Ensure that the top of the lever is interposed between the self adjuster pushrod and the front brake shoe.

(18) Instal the lower return spring and lever the front brake shoe onto the anchor point.

(19) Secure the front brake shoe with the retaining clip and pin. Instal and rotate the brake drum.

(20) Remove the brake drum and increase the length of the adjuster by turning the ratchet wheel. Check that the brake drum fits without dragging.

Repeat this adjusting procedure until the brake shoes are closest to the brake drum without dragging.

(21) Fit the brake drum and the road wheel. Bleed the hydraulic system and adjust the handbrake as described under the appropriate heading.

(22) Lower the vehicle to the ground, check the wheel bolts for tightness and road test.

6. HANDBRAKE LEVER AND CABLE

TO REMOVE AND INSTAL HANDBRAKE LEVER

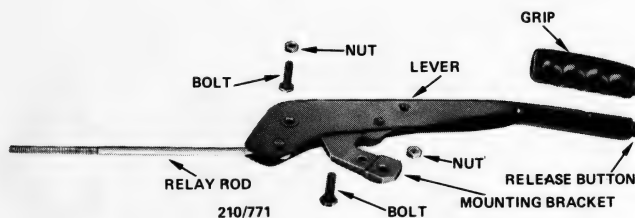
(1) Chock both front wheels and raise the rear of the vehicle and support on chassis stands as described in the Wheels and Tyres section.

(2) From beneath the vehicle remove the handbrake cable lock and adjusting nuts, the cable equaliser and the cable from the handbrake lever relay rod.

(3) Remove the centre console as described in the Body section.

(4) Remove the handbrake warning lamp switch from the handbrake lever.

(5) Remove the bolts and nuts retaining the hand-



View of handbrake lever assembly.

brake lever and lever ratchet to the handbrake lever mounting bracket.

(6) Where fitted remove the spring clip from the relay rod grommet.

(7) Remove the handbrake lever assembly from the vehicle, taking care not to damage or dislodge the relay rod grommet when drawing the relay rod through the grommet.

(8) If the handbrake lever mounting bracket needs to be removed, remove the nuts retaining the bracket to the floor studs and remove the bracket.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Lubricate all working points of the handbrake mechanism when assembling.

(2) Ensure that the rubber grommet that fits over the relay rod is not disturbed when installing the handbrake assembly.

(3) Adjust the handbrake as described under Brake Adjustments.

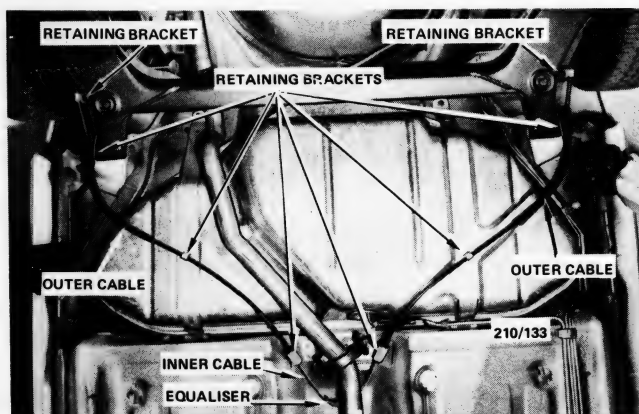
TO REMOVE AND INSTAL HANDBRAKE CABLE

(1) Chock both front wheels and raise the rear of the vehicle as described in the Wheels and Tyres section. Remove the rear road wheels.

(2) Remove the handbrake cable lock and adjusting nuts, the cable equaliser and the cable from the handbrake lever relay rod.

(3) Withdraw the outer handbrake cables rearwards out of the support brackets and the inner cable out from in between the support brackets and the floor panel.

(4) Open up the retaining brackets which secure



Installed view of handbrake cable.

the handbrake cable to the fuel tank, the rear suspension control arms and the rear axle support brackets.

(5) Remove the brake drums from the rear hubs. If necessary refer to the Rear Brake Assembly heading.

(6) Disconnect the handbrake cable from the handbrake actuating levers on the rear brake shoes.

(7) Pull the inner handbrake cable and the return spring towards the rear brake shoe.

(8) Remove the outer cable split guide retainer from the brake backing plate and then from the inner cable.

(9) Pull the cable assembly forwards out of the backing plate and remove the cable assembly from the vehicle.

Installation is a reversal of the removal procedure with attention to the following points:

(1) With the handbrake cable fully installed ensure that the stop pins on the actuating levers are up against the rear brake shoe webs and so do not allow the actuating levers to be positioned fully rearwards.

(2) When securing the cable to the rear axle support brackets bend only the front tab on the cable retaining clip.

(3) Adjust the handbrake as described under Brake Adjustments.

7. BRAKE SERVO UNIT

DESCRIPTION

The brake servo unit is installed between the brake pedal and the brake master cylinder.

The valve and rod assembly of the servo unit and the pedal pushrod are on the same axis and in case of a vacuum failure act as a single pushrod without assistance.

The servo unit is connected by a hose to the inlet manifold.

The only items which normally require attention are the one way check valve and the hose connection.

TO CHECK OPERATION

(1) With the engine switched off, apply the foot brake several times to exhaust all vacuum from the system.

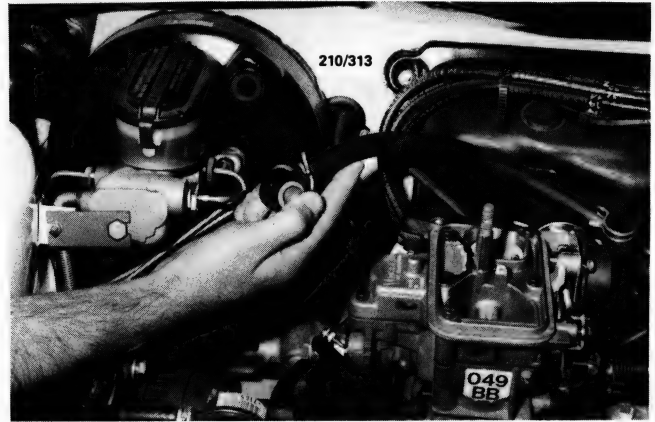
(2) Again apply the foot brake, but this time hold the brake pedal fully depressed.

(3) Start the engine. If the servo unit is functioning satisfactorily a distinct downward movement of the brake pedal should be noticed.

Should the pedal fail to fall away when the engine has been started, then the vacuum system can be considered inoperative.

NOTE: If the pedal continues to fall away then there is a fault in the hydraulic system.

(4) Ensure that the brake pedal is fully off, start the engine and run it at medium speed. Stop the engine. Let the vehicle stand for 1-2 minutes, then press the



Disconnect the one way check valve from the servo unit and using a finger check for vacuum. The engine must be running for this test.

brake pedal two or three times and check its operation.

If there is no vacuum assistance, then the vacuum system has developed a leak or the one way check valve is defective.

NOTE: Before removing the servo unit from the vehicle for inspection, disconnect the vacuum supply hose at the unit, then start the engine and check that the manifold vacuum is in fact reaching the servo unit. Also check the one way check valve as described below.

TO TEST ONE WAY CHECK VALVE

(1) Release the hose clip and disconnect the hose from the one way check valve. Prise the check valve from the 'O' ring in the servo unit, and remove the check valve from the vehicle.

(2) Check the valve for sticking. Suction on the manifold side should allow air to flow freely. Air blown into the valve from the manifold side should not be able to flow through the valve.

(3) Check the 'O' ring for deterioration and renew if necessary.

(4) Instal the valve and check the operation of the servo unit as previously described.

NOTE: Check that there are no air leaks at the hose connections and that the hose clips are tight. Also check that the hose is not bulged or collapsed due to deterioration.

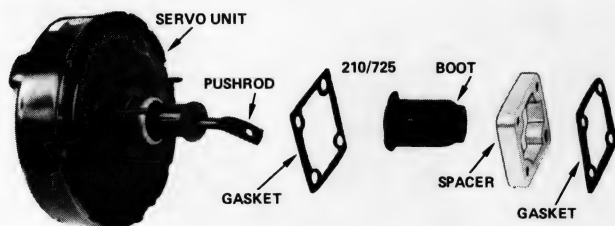
TO REMOVE AND INSTAL SERVO UNIT

(1) Remove the brake master cylinder as previously described.

(2) Disconnect the vacuum hose from the check valve.

(3) Remove the air cleaner assembly from the engine. Refer to the Fuel System section if necessary.

(4) Working inside the vehicle remove the lower trim panel near the brake pedal. Remove the spring clip



View of brake servo unit and components.

and washer from the brake pedal clevis pin and slide the pushrod from the clevis pin.

(5) Remove the nuts securing the servo unit to the brake pedal bracket and remove the servo unit with the spacer plate and gaskets from the engine compartment.

Installation is a reversal of the removal procedure but it will be necessary to bleed the hydraulic system.

8. BRAKE PEDAL

TO REMOVE AND INSTAL

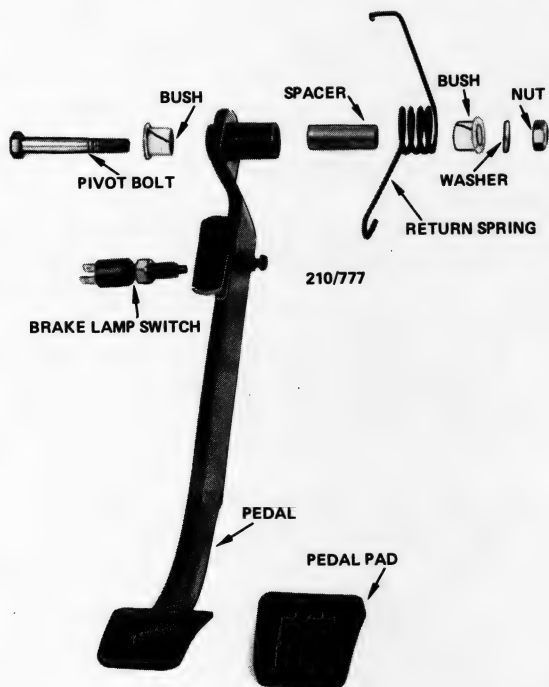
(1) Working inside the vehicle remove the lower trim panel near the brake pedal.

(2) Remove the spring clip and outer washer retaining the brake servo unit pushrod to the brake pedal clevis pin.

(3) Disconnect the brake servo unit pushrod and remove the inner washer from the brake pedal clevis pin.

(4) Disconnect the pedal return spring from the return spring anchor pin on the pedal.

(5) Remove the retaining nut from the pedal pivot bolt.



Dismantled view of brake pedal and components.

(6) Slide the pedal pivot bolt out of the pedal bracket and lower the pedal, ensuring not to lose the stepped washer if it does become dislodged from the pedal bracket. Remove the pedal return spring from the pedal bracket.

(7) Remove the spacer and the bushes from the pedal.

(8) Inspect the pedal pivot bolt and pivot bushes for wear and renew as necessary.

(9) Inspect the pedal for cracks, bend and wear and renew as necessary.

(10) Inspect the return spring for fatigue by comparison with a new return spring and renew as necessary.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Apply a coating of molybdenum disulphide grease to all metal to metal contact surfaces before installing.

(2) Ensure that the stepped washer is installed in the pedal bracket with its stepped side towards the bracket.

(3) Ensure that the pedal return spring is installed correctly and the pedal pivot bolt is inserted from the left hand side.

(4) Check the stop lamp operation. The stop lamps should be on when the pedal has been depressed 16 mm at the pedal pad.

NOTE: To adjust the stop lamp switch, disconnect the electrical wire from the switch and loosen the stop lamp switch locknut. Hold the pedal down 16 mm and turn the stop lamp switch in the required direction until the stop lamps come on. Release the pedal and check that the lamps switch off. Tighten the locknut on the stop lamp switch.

9. BRAKE ADJUSTMENTS

REAR BRAKE SHOES AND HANDBRAKE

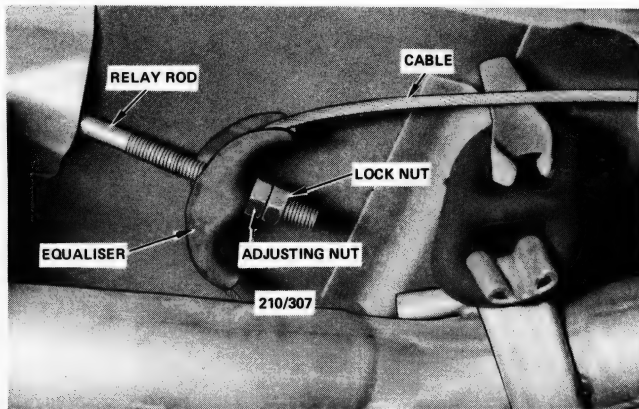
(1) Check both front wheels, raise the rear of the vehicle and support on chassis stands as described in the Wheels and Tyres section.

(2) Rotate the wheels in a forward direction to ensure that the brake shoes are not dragging.

(3) Depress the brake pedal two or three times to centralise the shoes, then apply and release the handbrake a few times.

(4) To check if the adjustment is completed, depress the brake pedal a few times rapidly. If the stroke of the pedal is the same on each application the adjustment is correct.

NOTE: When the rear brakes have been dismantled an initial adjustment should be made by moving the ratchet wheel to lengthen the strut assembly. By 'trial and error' the strut should be lengthened until the brake drum just



View of handbrake cable adjusting point.

fits without dragging and the self adjusting lever engages in the ratchet wheel.

- (5) Pull the handbrake onto the sixth notch position.
- (6) Loosen the handbrake relay rod locknut and adjust the handbrake relay rod adjusting nut a little at a time until a moderate drag is felt at the rear wheels.
- (7) Release the handbrake and check that the wheels rotate freely.
- (8) Secure the locknut on the relay rod and lower the vehicle to the ground.

10. HYDRAULIC SYSTEM

Bleeding the system should only be necessary when some portion of the hydraulic system has been disconnected or fluid drained off, allowing air to enter the system.

The brake fluid in the hydraulic system should be changed at regular intervals, refer to the Lubrication and Maintenance section.

There are four points in the system where bleeder valves are fitted. One on each front brake caliper and one bleeder valve on each rear wheel cylinder.

TO BLEED

- (1) Raise the front and rear of the vehicle and support on chassis stands as described in the Wheels and Tyres section. Ensure that the vehicle is level.
- (2) Fill the fluid reservoir on the master cylinder with clean brake fluid and maintain it at least half full throughout the entire bleeding operation.
- (3) If the master cylinder is to be included in the bleeding operation, disconnect the brake pipes leading to the front calipers from the master cylinder.
- (4) Allow brake fluid to flow from the master cylinder outlet ports until no more air is emerging from the outlet ports. Reconnect the two brake pipes to the master cylinder.

NOTE: Care should be taken to ensure that brake fluid is not permitted to drop onto the

surrounding paintwork of the vehicle. Brake fluid, if spilt, should be immediately washed away with water and then allowed to dry naturally and not wiped with a cloth.

- (5) Push the brake pedal down slowly once only and hold the pedal down. Slacken off the front right hand side brake pipe connection on the master cylinder and observe if any air is emerging from the brake pipe connection.

- (6) Tighten the brake pipe and slowly release the brake pedal.

- (7) If air was emerging from the connection repeat the above operation until all air is expelled.

- (8) Repeat operations (5) and (6) on the rear right hand side brake pipe connection on the master cylinder, followed by the brake pipe connections leading to the rear wheel cylinders (left hand side of master cylinder).

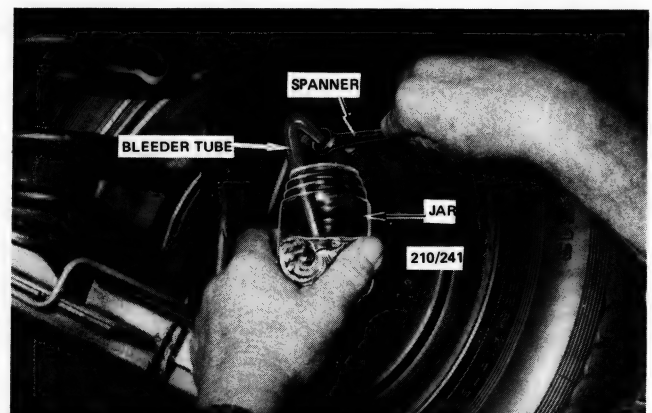
- (9) Remove the dust cap from the left hand side rear wheel cylinder bleeder valve and attach a rubber bleeder tube to the bleeder valve. Allow the other end of the tube to be immersed in a small amount of brake fluid contained in a clean glass jar.

- (10) Depress the brake pedal slowly once only and with the brake pedal depressed, open the bleeder valve. Close the bleeder valve whilst air, or fluid and air, is escaping from the bleeder valve. Allow the brake pedal to return slowly and repeat this step until air bubbles cease to flow from the bleeder tube.

NOTE: Do not pump the brake pedal rapidly before opening the bleeder valve as this practice makes the hydraulic system difficult to bleed due to aeration of the brake fluid.

- (11) Repeat operations (9) and (10) to the right hand front, the right hand rear and the left hand front bleeder valves in that order.

NOTE: Do not allow the fluid in the reservoirs to fall below the half full level at any time during the bleeding operation or air may enter the system and a fresh start will have to be



Method of bleeding air from brake hydraulic system.

made. Always use new fluid for topping up the reservoirs.

(12) After bleeding the system the brake pedal should be firm when depressed with no evidence of sponginess. Ensure that all the bleeder valves are tight.

NOTE: If sponginess is evident in the brake system after the bleeding operations are completed, it may be necessary to pressure bleed the system to expel all traces of air from the lines. This is best left to an authorised dealer or brake specialist.

(13) Top up the master cylinder reservoirs with new brake fluid and lower the vehicle to the ground.

TO RENEW BRAKE FLUID

(1) Raise the front and rear of the vehicle and support on chassis stands as described in the Wheels and Tyres section. Ensure that the vehicle is level.

(2) Mark the installed position of the front road wheels in relation to the wheel hubs and remove the front road wheels.

(3) Remove the master cylinder reservoir cap and seal.

(4) Disconnect the brake pipes from the master cylinder and let the brake fluid drain from the master cylinder until the master cylinder is empty.

(5) Fill the fluid reservoir on the master cylinder with clean brake fluid and maintain them at least half full

throughout the entire fluid change operation.

(6) Again allow fluid to flow from the master cylinder outlet ports until no more air is emerging from the outlet ports.

(7) Reconnect the brake pipes to the master cylinder.

(8) Loosen the bleeder valve on the left hand side caliper assembly.

(9) Remove the bolts retaining the caliper anchor plate to the steering knuckle and lift the caliper and anchor plate off the brake disc.

(10) Remove the bleeder valve from the caliper and holding the caliper upside down, drain the old fluid into a drain tin. Discard the fluid.

(11) Instal the bleeder valve to the caliper and fit the caliper and anchor plate assembly to the steering knuckle. Tighten the anchor plate retaining bolts to Specifications.

(12) Repeat operations (8) to (11) for the right hand side caliper.

(13) Continue the fluid change procedure as previously described under To Bleed — operations (9) to (11), ensuring that new brake fluid is flowing each time from the caliper or wheel cylinder before continuing with the next side.

(14) Ensure that all brake pipe connections and bleeder valves are securely tightened. Top up the master cylinder reservoirs.

(15) Instal the front road wheels and lower the vehicle to the ground.

CAUTION: To prevent severe electrical shock extreme care must be taken when working on or near the electronic ignition system as dangerous high tension voltages are produced in both the primary and secondary circuits. See text for precautionary notes.

SPECIFICATIONS

BATTERY

Type 12 volt lead acid
Polarity to earth Negative (-)

* Specific gravity:
Fully charged Above 1.260
Fully discharged Below 1.130

* Electrolyte specific gravity varies 0.007 for every 10 deg C rise or fall in temperature above or below 20 deg C. For above temperature add, for below temperature subtract.

ALTERNATOR

Type 14 volt AC
Make Lucas

Maximum output:
14 ACR 45 45 amps
14 ACR 55 55 amps
Polarity to earth Negative (-)
Stator windings Star connected
Brush length - minimum 6.5 mm

Rotor coil resistance at 20 deg C:
14 ACR 45 3.2 ohms
14 ACR 55 3.0 ohms

Stator coil resistance at 20 deg C:
14 ACR 45 0.116 ohms
14 ACR 55 0.077 ohms

ALTERNATOR REGULATOR

Type Integral non adjustable
Regulating voltage 14.1-14.5 volts

STARTER MOTOR

Make Bosch
Type Pre-engaged
Number of brushes 4
Brush length - minimum 11 mm
Brush spring tension 17 N
Undercut of commutator - maximum 0.79 mm
End float 0.05-0.30 mm
Solenoid pull in 6 volts

DISTRIBUTOR

Make Bosch
Rotation of rotor Clockwise as viewed from front
Firing order 1-3-4-2
Control Vacuum and Centrifugal advance

IGNITION COIL

Make Bosch
Primary resistance at 20 deg C 0.75-0.84 ohms
Secondary resistance at 20 deg C 4860-5940 ohms
High tension lead resistance 12000-24000 ohms per metre
Primary voltage - maximum 350 volts

NOTE: See Engine Tune-up section for electrical tuning Specifications.

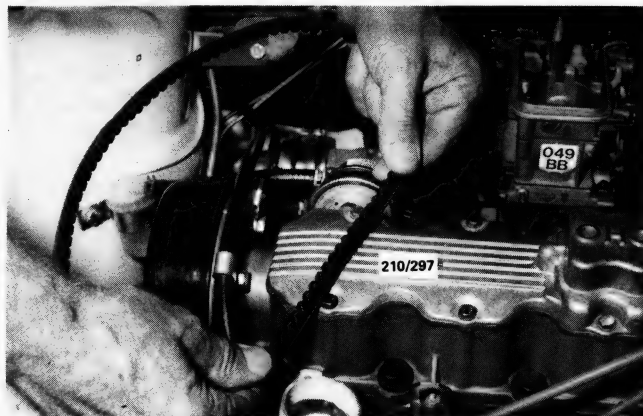
TORQUE WRENCH SETTINGS

Alternator pulley nut 68 Nm
Starter motor mounting bolts:
Upper bolt 90 Nm
Lower bolt 51 Nm

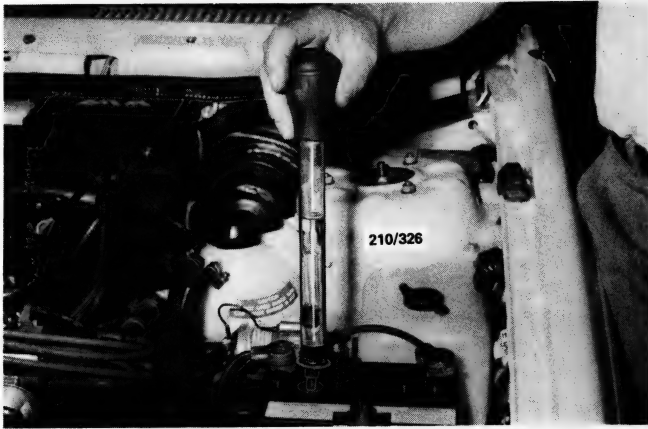
1. BATTERY AND CHARGING SYSTEM TROUBLE SHOOTING

BATTERY UNDERCHARGED

- (1) Loose or broken alternator drive belt: Adjust or renew drive belt.
- (2) Faulty alternator regulator: Renew regulator unit.
- (3) Faulty battery: Instal a new battery of the recommended type and capacity.
- (4) Faulty alternator: Overhaul or renew alternator.
- (5) Fault in charging system wiring: Check and renew or repair wiring harness.
- (6) Faulty connections in charging system: Check and renew or repair component(s).



Inspect the alternator drive belt for wear and damage.



Check the specific gravity of the battery electrolyte in each cell with a hydrometer.

NOTE: The first thing to do is to test the state of charge of the battery with a hydrometer. As specific gravity varies with temperature it is advisable to use a hydrometer with an inbuilt thermometer so that the necessary variation can be calculated. Also an accurate hydrometer reading cannot be taken if distilled water has recently been added to the electrolyte. If the electrolyte level is below the battery plates it will be necessary to add water and charge the battery before testing with the hydrometer.

The specific gravity should not vary more than 0.030 between cells. If the variation is more than this then the serviceability of the battery is questionable and the battery should be recharged and retested before renewing it.

If all readings are above 1.225 and uniform the battery can be considered to be operational. However, it may require recharging depending on the reading. See attached chart showing charge condition for the various specific gravity reading.

1.110–1.130	Dead flat
1.140–1.160	Nearly flat
1.170–1.190 ...	About one quarter charged
1.200–1.225	Half charged
1.230–1.250	About three quarters charged
1.260–1.280	Fully charged

If the battery is undercharged but serviceable seek out the cause by checking out the possible causes in the order given.

BATTERY OVERCHARGED

- (1) Faulty alternator regulator: Renew regulator.
- (2) Faulty battery: Renew battery.
- (3) Faulty alternator: Overhaul or renew alternator.

- (4) Faulty charging system wiring: Check and repair faulty wiring.

NOTE: An overcharged battery is indicated by continual loss of water through boiling. This is usually accompanied by discoloration of the electrolyte.

CHARGE INDICATOR LAMP REMAINS ON

- (1) Loose or broken alternator drive belt: Adjust or renew drive belt.
- (2) Faulty regulator unit: Check and renew regulator.
- (3) Faulty alternator: Check and overhaul alternator.
- (4) Short to earth in warning light circuit: Check and repair circuit.

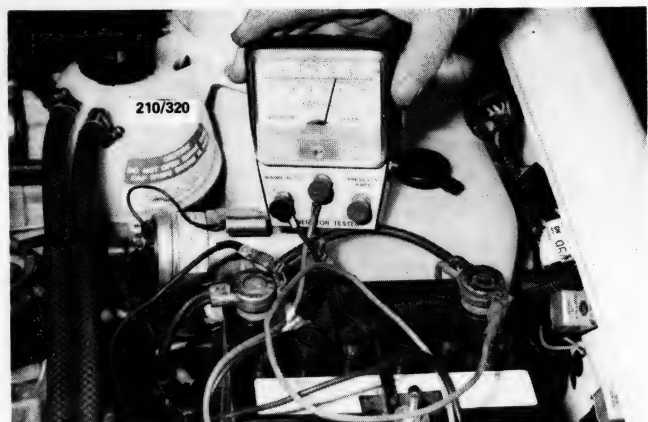
NOTE: Check out the no charge condition by checking out the possible causes in the order given.

CHARGE INDICATOR LAMP DOES NOT OPERATE

- (1) Lamp bulb blown: Check and renew faulty bulb.
- (2) Open circuit in wiring or bulb socket: Check and rectify open circuit.

NOISE IN DRIVE BELT OR ALTERNATOR

- (1) Drive belt frayed or out of alignment with pulleys: Renew drive belt and/or align pulleys.
- (2) Loose alternator mounting bolts or worn bearings: Tighten mounting bolts and/or renew bearings.
- (3) Loose alternator pulley: Tighten pulley retaining nut.
- (4) Faulty alternator: Overhaul or renew alternator.



With the engine running at approximately 2000 rpm, check the charging system output voltage by connecting a voltmeter across the battery terminals.



Spin the alternator pulley over by hand to check bearings for noise.

- (5) Faulty diodes in alternator: Overhaul alternator, fit new heat sink.

NOTE: To check if the noise is in the alternator or drive belt loosen off the alternator and remove the drive belt. If the noise is gone when the engine is run for a short time, check the serviceability of the belt and alternator components.

2. BATTERY AND STARTING SYSTEM TROUBLE SHOOTING

STARTER LACKS POWER TO CRANK ENGINE

- (1) Battery undercharged: Check the charging system and rectify as necessary.
- (2) Battery faulty, will not hold charge: Check and renew battery.
- (3) Battery terminals loose or corroded: Clean and tighten terminals.
- (4) Faulty starter motor: Check and overhaul starter motor.
- (5) Faulty starter solenoid switch or contacts: Check and renew solenoid as necessary.

NOTE: Check the state of charge of the battery and check all terminals for cleanliness and security.

STARTER WILL NOT ATTEMPT TO CRANK ENGINE

- (1) Open circuit in starting system: Check for dirty or loose terminals, dirty commutator, faulty solenoid or faulty switch.
- (2) Discharged battery: Check for fault or short circuit in system.
- (3) Battery fully charged but will not crank engine: Check for locked drive and ring gear, internal starter fault or seized engine.
- (4) Faulty neutral safety switch: Check and renew

faulty neutral safety switch. (Automatic transmission only. Refer to that section for details.)

NOTE: Turn engine over by hand to ensure that the starter drive is not locked with the fly-wheel ring gear and that the engine is not seized. Ensure that the ignition is switched off before turning the engine.

3. LIGHTING SYSTEM TROUBLE SHOOTING

LAMP OR LAMPS FAIL TO LIGHT

- (1) Faulty bulb(s): Check and renew faulty bulb(s).
- (2) Open circuit in wiring or connections: Check out lamp circuits and rectify as necessary.



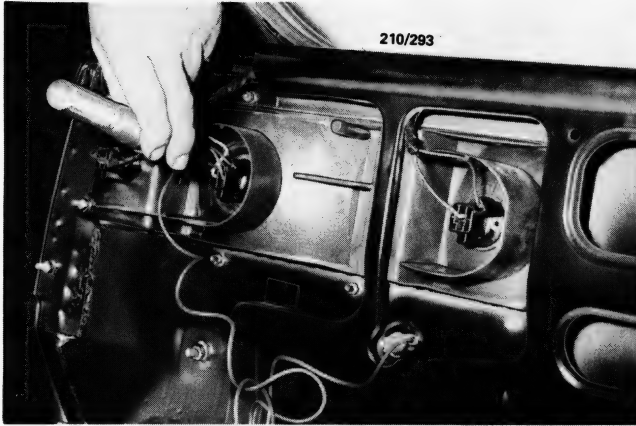
Using a test lamp check that the headlamp circuits are operating.

- (3) Faulty lamp switch: Check and if necessary renew lamp switch.
- (4) Faulty fuse or fuse connection, if fitted: Rectify fuse connection or renew fuse.

NOTE: Switch on the lamps concerned and using a test lamp, check that the lamp circuits are operating. This is best done by starting at the lamp wiring connector or bulb holder and working back to the power source.

LAMP OR LAMPS INCORRECTLY ILLUMINATED

- (1) Lamp or lamps incorrectly earthed: Check lamp earth for looseness or clean contact, either at lamp body or wire and repair as necessary.
- (2) Incorrect bulbs fitted: Check out bulbs wattage and voltage and renew with the correct type if necessary.
- (3) Dirty or damaged lamp reflector: Clean or or renew lamp reflector.
- (4) Faulty bulbs: Check out with a known serviceable bulb and renew if necessary.
- (5) Dirty lamp lens: Clean or renew lamp lens.



Using a test lamp to check the rear lamp circuit.

NOTE: The most common cause for this condition is incorrect lamp earthing. Check the lamps at their earthing points.

LAMPS FLARE WITH ENGINE SPEED INCREASE

- (1) Faulty battery: Check and renew battery.
- (2) Battery in low state of charge: Recharge battery and check charging system.
- (3) High resistance or faulty connections between alternator and battery: Check circuit and rectify condition.
- (4) Poor earth connection between battery and engine or alternator: Check battery earth lead and strap between engine and body.
- (5) Voltage regulator faulty: Check and renew voltage regulator.

NOTE: The most common cause for this condition is dirty terminals on the earth leads. Check all earth leads at their earthing points.

4. TURN SIGNAL LAMP SYSTEM TROUBLE SHOOTING

TURN SIGNAL WARNING LAMP DOES NOT BURN AND NO AUDIBLE CLICKING FROM FLASHER UNIT WHEN TURN IS SELECTED ON SWITCH LEVER

- (1) Fuse blown: Rectify fault and renew fuse.
- (2) Bulb blown on one or both sides: Check system and renew bulb(s).
- (3) Faulty flasher unit: Renew flasher unit. Do not attempt repair.
- (4) Faulty turn signal switch: Renew or repair switch.
- (5) Fault in wiring circuit: Check and repair fault.

NOTE: If the bulbs and fuse are functional check the flasher unit for serviceability by replacing with a known serviceable unit.

TURN SIGNAL WARNING LAMP DOES NOT FLASH BUT AUDIBLE CLICKING FROM FLASHER UNIT, WHEN TURN IS SELECTED ON SWITCH LEVER

- (1) Warning lamp bulb blown: Check and renew bulb.
- (2) Fault in wiring circuit: Check and repair fault.

NOTE: When renewing bulbs ensure that a new bulb of the correct wattage is used.

BOTH WARNING LAMPS FLASH WEAKLY AND AT GREATER THAN NORMAL SPEED WHEN TURN IS SELECTED ON SWITCH LEVER

- (1) Front bulb blown on turn side: Check and renew bulb.
- (2) Rear bulb blown on turn side: Check and renew bulb.



If the flasher unit is suspect, replace it with a known serviceable unit.

- (3) Faulty flasher unit: Check and renew flasher unit.

NOTE: When one lamp unit is constantly blowing bulbs check for high resistance in circuit.

BOTH WARNING LAMPS BURN CONSTANTLY WHEN TURN IS SELECTED ON SWITCH LEVER

- (1) Front bulb blown on turn side: Check and renew bulb.
- (2) Faulty flasher unit: Check and renew the flasher unit.

NOTE: If the flasher unit is to be renewed always try to obtain a genuine replacement part.

5. IGNITION SYSTEM TROUBLE SHOOTING

ENGINE WILL NOT START

- (1) Fault in ignition primary circuit wiring: Check ignition primary circuit and repair as necessary.
- (2) Faulty ignition switch: Renew ignition switch.
- (3) Fault in coil primary winding: Renew ignition coil.
- (4) Electronic control unit not securely earthed: Earth control unit body.



Check the inside of the distributor cap for cracks or tracking.

- (5) Fault in coil high tension circuit: Test and renew ignition coil as necessary.
- (6) Cracks in distributor cap: Renew distributor cap.
- (7) Cracks in distributor rotor: Renew distributor rotor.
- (8) Faulty high tension leads: Check and renew high tension leads.
- (9) Faulty or incorrectly adjusted spark plugs: Renew or clean and adjust spark plugs.

NOTE: Refer to the Roadside Trouble Shooting section and make the necessary tests to ensure that the trouble is in ignition system.



Check the high tension leads for perishing or cracking. Also check the cable ends for corrosion.

ENGINE STARTS BUT MISFIRES UNDER LOAD

- (1) Faulty, dirty or incorrectly adjusted spark plugs: Renew or clean and adjust spark plugs.
- (2) Condensation moisture in distributor cap: Check and dry out and examine cap for cracks.
- (3) Cracked spark plug insulator(s): Renew faulty spark plug(s).
- (4) Faulty ignition coil: Check and renew ignition coil.

NOTE: Faulty high tension leads may also cause the engine to misfire under load.

ENGINE RUNS BUT LACKS POWER

- (1) Ignition timing incorrectly set: Check and re-adjust timing.
- (2) Centrifugal advance mechanism seized or excessively worn: Overhaul distributor.
- (3) Vacuum advance unit inoperative: Check for broken vacuum pipe or faulty unit.
- (4) Vacuum advance unit operates but ineffective: Advance unit link disconnected or broken.

6. TEST EQUIPMENT AND SOME APPLICATIONS

TO MAKE A TEST LAMP

When working on the electrical system, a test lamp will be found to be most helpful for checking the continuity of live circuits. A simple test lamp can be made from two suitable lengths of 4 millimetre wire, two small alligator type clips, a double contact bulb holder and a 12 volt single filament double contact bulb.

- (1) Bare both ends of the two lengths of 4 millimetre wire.
- (2) Solder an alligator clip to one end of each wire lead.
- (3) Connect the other end of each lead to the double contact bulb holder terminals and ensure that they are insulated from each other and from the bulb holder base.
- (4) Instal the bulb in the bulb holder.
- (5) To test the unit connect it across a 12 volt battery, the bulb should light up if the wiring is correct and the bulb serviceable.

TO MAKE A JUMPER LEAD

When testing components of the electrical system a jumper lead is very handy.

- (1) Bare both ends of a suitable length of 4 millimetre wire.
- (2) Connect a small alligator clip to each end of the wire. Solder and tape the connections.

NOTE: Make a few test leads of various lengths using different sizes and types of alligator and battery clips.

TO TEST SWITCHES

If a switch is suspected of being faulty remove the wires from the switch and using a test lamp test each lead to find the power wire. It may be necessary to turn the ignition switch "ON" as the switch may be wired through the ignition circuit.

After noting the color/position of the wire, disconnect the test lamp and using a suitable jumper lead, connect the jumper lead from the power wire of the switch to the other side of the switch. If the circuit functions the switch is faulty and should be renewed. See Switches and Controls for the correct removal and installation procedure.

TO TEST BULBS

If a bulb is suspected of being faulty, remove the bulb from the bulb holder and using a small jumper lead connect one end of the jumper lead to the power terminal of a serviceable battery and the other end of the jumper lead to a lug on the side of the bulb.

Connect one end of a second jumper lead to the earth terminal of the battery and with the other end of the jumper lead touch the bulb contact. The bulb should light.

If the bulb has two filaments, touch the other bulb contact with the end of the jumper lead. The bulb should light. If the bulb should fail to light the bulb should be replaced with a bulb of the correct voltage and wattage.

TO TEST CIRCUITS

If a circuit is suspected of being faulty, turn the switch ON in the normal manner so as to supply power to the circuit.

Where connections are in the circuit disconnect the connection and connect one lead of the test lamp to the power switch side of the disconnected circuit and the other lead of the test lamp to a clean earth (eg. bolt or screw). If the lamp does not light, check the circuit towards the power or switch end of the circuit.

If the lamp lights, continue checking towards the motor or bulb in the circuit.

NOTE: A fuse or its associated components is always a good starting point, but reconnect each connector or fuse after testing that particular connector of fuse.

7. BATTERY**Special Equipment Required:**

To Test - Hydrometer

MAINTENANCE

Maintenance consists mainly of regular inspection and servicing.

(1) Keep the battery and its surroundings clean and dry. Give the top of the battery particular attention to

prevent electrical leakage between the cell terminals.

(2) Remove the vent plugs and check that the vent holes are clear.

(3) Check the electrolyte level and top up as necessary. The correct level is just over the top of the separators. Do not overfill or acid will escape through the vent holes with detrimental effect to the connections and to adjacent parts of the vehicle.

(4) Use only distilled water for topping up.

NOTE: Never use a naked light when examining the battery, as the gases given off by the battery can be dangerously explosive.

(5) If the battery required an excessive amount of topping up, the cause should be sought. If overcharging is suspected, then have the regulator checked by an automotive electrical specialist.

If one cell in particular is at fault, check the case for cracks. Never transfer electrolyte from one cell to another.

(6) Keep the terminals clean and apply a small amount of petroleum jelly to the terminals to prevent corrosion.

TO REMOVE AND INSTALL

(1) Release the terminal clamp and remove the negative terminal from the battery post.

(2) Remove the positive terminal in the same manner.

(3) Undo the retaining nuts, remove the battery holding clamp and lift the battery from the vehicle.

Installation is a reversal of the removal procedure with attention to the following:

Lightly smear the terminals with petroleum jelly to prevent corrosion and ensure the earth polarity is correct.

TO CLEAN BATTERY CASE

(1) Remove the battery from the vehicle as previously described.

(2) Pour hot water over the battery being careful not to pour water through the vent holes of the filler caps.

(3) Wipe the battery case clean.

(4) If there is a crack in the case or around the base of the terminal(s) the battery should be renewed.

TO CLEAN BATTERY CARRIER

If the battery electrolyte has overflowed and contaminated the surrounding body panels it will be necessary to remove this contamination and repaint the surfaces where necessary. The contamination can be neutralised by using an alkaline solution consisting of two table-spoons of washing soda to a quart of boiling water. Cloudy ammonia can also be used in concentrated form. Both these items are readily available at grocery stores.

After neutralising the contaminated body panels allow them to dry. Clean off the old paint and repaint the surfaces with an anti rust based paint.

TO TEST

Use a hydrometer to check the specific gravity of the battery electrolyte. Refer to Specifications for a fully charged and fully discharged battery.

If the battery is in a low state of charge or completely flat take it to an automotive electrical shop to have it charged and load tested.

8. ALTERNATOR**Special Equipment Required:**

To Test on Vehicle—Voltmeter, 0–60–0 ammeter

To Dismantle—Soldering iron, press, bearing puller

To Assemble—Soldering iron, press

DESCRIPTION

In the alternator the 'field and pole shoe assembly' is the moving part and it is shaped to form the rotor. Since only a low amperage current flows between the slip rings on the rotor shaft and the brushes, wear on brushes and slip rings is very slight and maintenance is reduced to a minimum.

The output current is generated in the fixed stator windings and is a three phase alternating current (AC). The stator windings are wound on a laminated soft iron former, are star connected and fitted between the end brackets.

As it is not possible to recharge a storage battery with alternating current, it is necessary to rectify the output of the stator windings to direct current (DC). This is done by a bank of diodes mounted within the alternator slip ring end bracket.

The output of the alternator is governed by the regulator and built in characteristics of the alternator.

The regulator and brush holder assembly is fitted within the alternator on the slip ring end bracket side.

An electrical cut out unit is not necessary with the alternator charging system as the diodes prevent a reverse current flow through the alternator.

SERVICE PRECAUTIONS

(1) Make sure the battery is connected with the correct polarity to earth. Refer Specifications.

(2) Do not short out or ground any terminals common to the charging circuit.

(3) Always disconnect the battery before connecting a battery charger.

(4) If a booster battery is used always connect it in a parallel circuit i.e. positive to positive (+ to +) and negative to negative (– to –) to maintain a 12 volt supply pressure.

(5) Never disconnect the battery or terminals in the charging circuit while the engine is running.

(6) Regularly check the alternator drive belt tension, deflection should be to Specifications. See Engine Tune-up section.

(7) Keep the battery terminals clean and all electrical connections tight.

(8) Disconnect the battery and alternator when electric welding on the vehicle.

TO TEST ON VEHICLE

If the ignition warning lamp stays on after the engine has been started and run at approximately 1000 rpm, carry out the following tests and precautions.

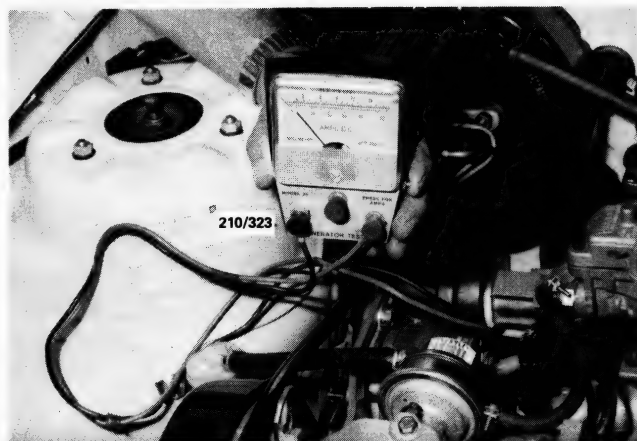
(1) Stop the engine, do not open circuit any parts of the charging circuit while the engine is running.

(2) Check the condition and adjustment of the alternator drive belt.

(3) Clean the battery terminals, tighten all electrical connections, check the wiring for shorts to earth and/or bridged circuits and make sure the battery is fully charged.

(4) Start the engine and allow it to run until normal operating temperature is reached.

(5) Stop the engine and disconnect the negative battery terminal.



Check the output current of the alternator using an ammeter.

(6) Remove the nut and washer from the alternator output terminal and disconnect the alternator output lead.

(7) Connect one lead of a 0–60–0 ammeter to the alternator output terminal and the other lead of the ammeter to the lead removed from the output terminal.

(8) Reconnect the battery negative terminal and connect a 0–20 voltmeter across the battery terminals.

(9) Switch on all lamps and allow them to burn for approximately five minutes to reduce the charge of the battery and to apply a load to the circuit.

(10) Start the engine and gradually increase the engine speed to approximately 2500 rpm. The reading on the ammeter should be approximately 75 per cent of the rated output of the alternator. (See Specifications).

(11) Switch off all the lamps and run the engine at 1500–2000 rpm until the indicated charge is below 10 amps. The voltmeter should now read between 14.1–14.7 volts.

NOTE: Should the alternator fail to reach the specified output the unit will have to be removed and overhauled or a replacement unit fitted. Should the voltage reading be above or below Specifications, the regulator will have to be renewed.

TO REMOVE AND INSTALL

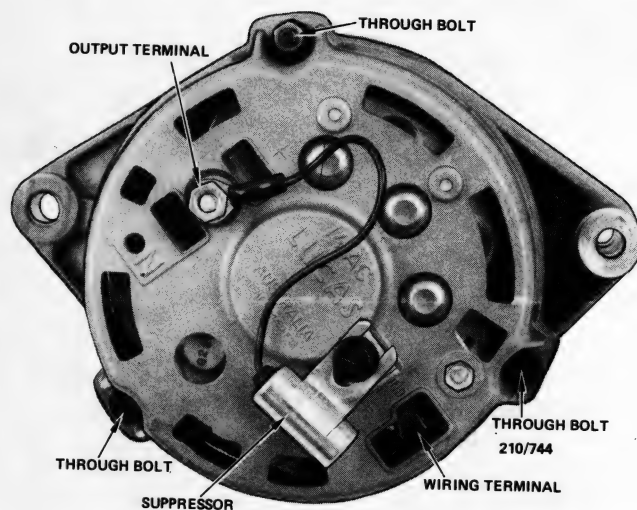
- (1) Disconnect the negative battery terminal.
- (2) Remove the air cleaner from the vehicle, refer if necessary to the Fuel System section.
- (3) Disconnect the terminal block from the rear of the alternator by pulling on the terminal block, not the wires.
- (4) Remove the nut and washer from the output terminal on the rear of the alternator and disconnect the output lead.
- (5) Remove the nut from the through bolt retaining the earth lead to the side of the alternator and disconnect the earth lead.
- (6) Remove the nut and bolt securing the alternator to the drive belt adjusting bar.
- (7) Remove the mounting bolt nut, push the alternator towards the engine and slip the drive belt from the pulley.
- (8) Withdraw the mounting bolt whilst supporting the alternator with the other hand. Remove the alternator from the vehicle.

Installation is a reversal of the removal procedure with attention to the following points:

- (1) Do not overtension the alternator drive belt, refer if necessary to the Engine Tune-up section for the adjusting procedure. Apply pressure to the drive end bracket only when adjusting the drive belt.
- (2) Check wiring where soldered to the terminals.

TO DISMANTLE

- (1) Remove the alternator from the vehicle as previously described.
- (2) Mark the assembled position of the alternator components by scribing a line from the front of the drive end bracket to the rear of the slip ring end bracket.
- (3) Support the alternator and remove the three through bolts holding the alternator components together.
- (4) Gently tap the drive end bracket with a soft faced hammer and withdraw the drive end bracket and rotor from the slip ring end bracket and stator assembly.
- (5) Remove the waved washer from the bearing recess in the slip ring end bracket.
- (6) Holding the rotor in a vice fitted with soft metal jaws, unscrew and remove the drive pulley nut and spring washer.
- (7) Withdraw the drive pulley, the pulley hub and cooling fan.
- (8) Support the drive end bracket in a press and



End view of alternator.

press the rotor shaft out of the bearing. Note the position of the spacers at the front and at the rear of the bearing.

- (9) If the drive end bearing is to be renewed, take out the three screws securing the retaining plate to the end bracket, remove the retaining plate and press the bearing out of the end bracket.

- (10) If the slip ring end bearing is to be renewed use a suitable puller to remove the bearing from the rotor shaft.

NOTE: If the slip ring end bearing remained in the bracket when the rotor was removed and is found to be difficult to extract, then drill two 3.5 mm holes from the outside of the slip ring end bracket, directly in line with the outer race of the bearing and diametrically opposite, drive the bearing out of the bracket using a suitable pin punch inserted in the drilled holes. Use care when driving the bearing out to avoid damage to the end bracket by driving one side of the bearing too far.

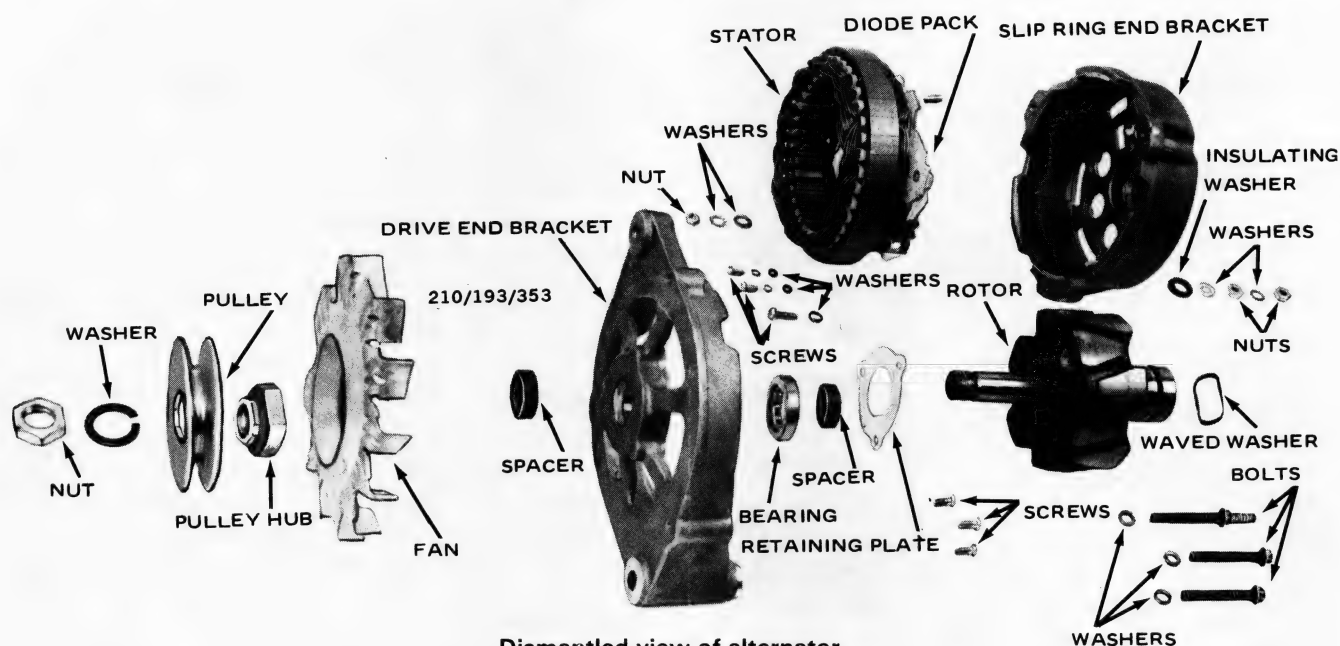
When bearings are removed note the position of the sealing shield on semi sealed bearings.

- (11) Working on the outer face of the slip ring end bracket remove the nuts with lock and insulating washers from the alternator positive terminal.

- (12) Working on the inside of the stator and slip ring end bracket, remove the nut and washers attaching the end of the heat sink to the end bracket.

NOTE: Check the position of all insulating washers and lock washers so they may be correctly located on assembly.

- (13) Remove the brush holder and the regulator screws, then carefully remove the stator, diode pack, brush holder and regulator as an assembly from the slip ring end bracket.



Dismantled view of alternator.

(14) Using a very hot soldering iron unsolder the two wires from the regulator unit at the brush holder assembly. Note the position of each wire before removing it from the brush holder. Remove the regulator unit.

(15) After removing the regulator wires from the brush holder, unsolder the field diode connections on the brush holder assembly using a very hot soldering iron, carry out the operation as quickly as possible to prevent the brush holder from warping due to heat transfer.

(16) Using a very hot soldering iron quickly unsolder the stator leads from the terminal strips on the diode pack while holding the leads with a pair of pointed pliers to dissipate the heat, separate the stator windings from the diode pack.

(17) In order to test the diodes each heat sink assembly must be separated. Using a very hot soldering iron and holding each diode lead in turn with a pair of pointed pliers quickly unsolder the diodes to separate the heat sinks. The positive, negative and exciter diode heat sinks are serviced as three separate units, do not attempt to remove the diodes from their heat sinks.

TO CLEAN PARTS

(1) Do not immerse units of the alternator in cleaning solvents as damage to the windings will result.

(2) The end brackets may be washed in kerosene or similar cleaning fluid after they have been completely dismantled from the unit. They should be thoroughly dried after cleaning.

(3) Compressed air can be used to carefully blow out the dust from the stator winding and the field winding on the rotor.

(4) Slip rings that are burned or scored should be polished using very fine glass paper.

(5) Clean the brushes and brush holders using a petrol damp rag and check and remove any burrs from the holders.

(6) Check the sealed ball type bearings for wear, roughness and lack of lubrication and replace as necessary.

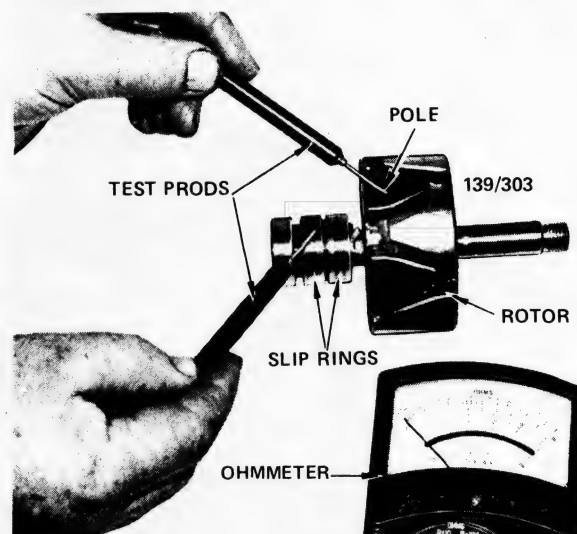
Unsealed type ball bearings if still serviceable may be lubricated with high melting point grease and installed for further service.

TO CHECK AND TEST COMPONENT PARTS

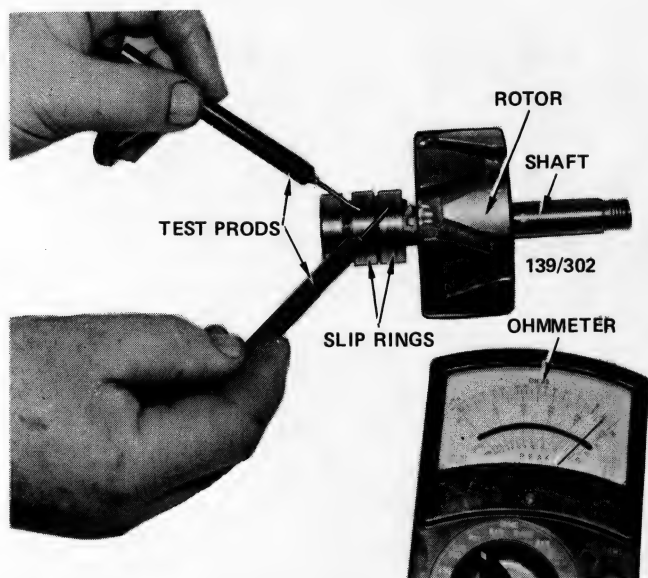
All parts being electrically tested should be resting on a non-conductive pad.

Field Windings and Rotor Assembly

(1) The insulation to earth test is done with an ohmmeter. Connect one of the test prods to one of the field wires or slip rings and the other test prod to one pole piece of the rotor.



Using ohmmeter to test field winding insulation.



Using ohmmeter to test for bridging or internal shorting of rotor fields.

(2) If the ohmmeter shows a reading and no visible earthing can be seen and rectified, a new rotor assembly will have to be fitted.

(3) To check for bridged or internal shorting of the field coils use an ohmmeter and check the resistance of the rotor windings. A low reading indicates a bridged circuit internally, a high reading indicates an open circuit or high resistance in the windings. In both cases a new rotor assembly will have to be fitted.

Stator Windings

The stator test is carried out using an ohmmeter and a test lamp.

(1) The stator leads must be detached from the diode pack.

(2) Connect one test probe of the ohmmeter to one stator lead and the other test probe to another stator lead. Note the ohmmeter reading.

(3) Repeat the operation to the remaining leads alternately to check each phase.

(4) If there is any variation in resistance between phases it will be necessary to renew the stator assembly.

(5) Connect a jumper lead from the negative terminal of a charged 12 volt battery to the stator winding frame. Connect one end of a test lamp to the battery positive terminal, the other end of the test lamp to the stator lead, one at a time.

(6) Should the test lamp light or burn dimly a short circuit is indicated and the stator assembly must be renewed.

Diodes

The diode pack(s) may be tested after disconnection. Testing can be done by using a 12 volt battery and a 1.5 watt bulb in series with a jumper lead.

(1) Connect the jumper lead from the negative terminal of a charged battery to the diode pack body holding the diodes to be tested.

(2) Connect one end of a test lamp to the battery positive terminal and the other end of the lamp lead to each diode lead in turn. Note whether the lamp is illuminated and then reverse the connections on the battery. Again test each diode with the test lamp lead.

(3) If the lamp was illuminated in both directions or was not illuminated at all, the diodes are faulty and the diode pack must be renewed.

Brush Springs and Brushes

(1) Unsolder and remove the brushes.

(2) Check the brush springs for overheating and distortion, check for binding in the brush holder.

(3) Check the brush length and renew as necessary. Refer to Specifications for the correct dimensions.

TO ASSEMBLE

The assembling procedure is the reverse of the dismantling operations with attention to the following points:

(1) Assemble the three diode pack heat sinks with the insulators and spacers as noted before dismantling.

(2) Using a very hot soldering iron and taking the necessary precautions to protect the diodes by holding the leads with a pair of pointed pliers solder the stator leads, bridging diode leads, regulator leads and brush holder leads to their correct positions as noted when dismantling.

(3) Position the stator assembly back onto the slip ring end bracket, aligning the marks made on dismantling and locate the positive terminal bolt in the hole in the bracket and the hole in the opposite end of the diode pack heat sink over the bolt in the inside of the end bracket.

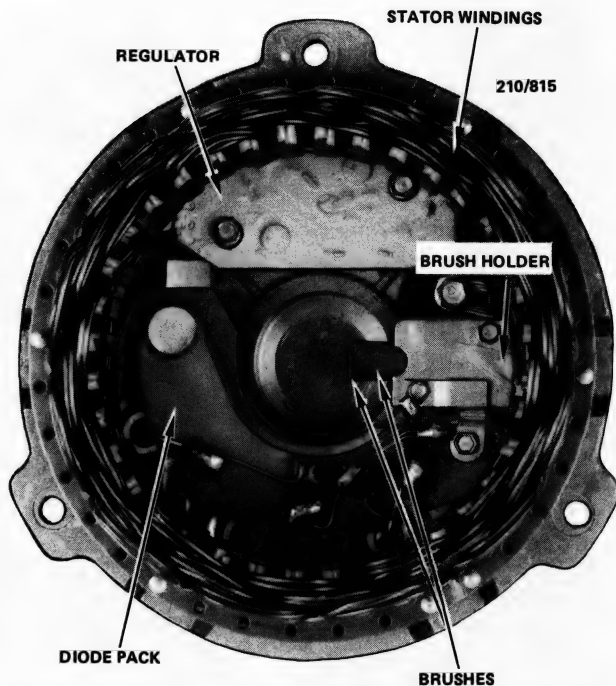
(4) Secure the diode pack heat sink to the end bracket by fitting the nut and washers to the bolt inside the stator and end bracket and one nut with insulating, flat and lock washers to the positive terminal bolt on the outside of the end bracket. Fit the remaining nut on the positive terminal.

NOTE: Ensure that the washers have been fitted in the locations from which they were taken during removal.

(5) Locate the brush holder on the end bracket and instal the single securing screw, ensuring that the two dowels on the brush holder register with the holes in the bracket before finally tightening the screw.

(6) Position the regulator on the end bracket with the nylon sleeves between the regulator and the end bracket and instal and tighten the two mounting screws. Note that the lock washer is fitted to the regulator screw farthest from the wires to the brush holder.

NOTE: Ensure that the screws and nuts are all tightened securely, but do not overtighten.



Internal view of alternator slip ring end bracket and stator.

(7) Lubricate the bearings sparingly with a high melting point grease.

(8) Press the bearing into the slip ring end of the rotor shaft pressing on the inner track of the bearing.

(9) Press the bearing into the drive end bracket pressing on the outer track of the bearing. Install the bearing retaining plate and screws.

(10) Press the drive end bracket and bearing onto the rotor shaft, ensure that the spacer is fitted to the rotor shaft before installing the end bracket assembly.

NOTE: When fitting bearings always apply the fitting pressure onto the section of the bearing being fitted. Do not apply fitting pressure through the balls or rollers.

(11) Install the spacer, fan, pulley hub, pulley, spring washer and nut, tighten the nut.

(12) Ensure that the waved washer is in position in the slip ring end bracket, press the brushes into the brush holder and insert a small steel pin approximately 2.5 mm into the guide hole in the head of the slip ring end bracket to hold the brushes in a retracted position.

NOTE: It may be necessary to remove the suppressor to gain access to the guide hole.

(13) Insert the rotor in the stator and slip ring end bracket assembly, fit the three through bolts and tighten the bolts securely.

(14) Remove the steel pin holding the brushes in a retracted position and turn the pulley by hand to ensure that the rotor will spin freely.

(15) Fit the alternator to the vehicle and check its operation as previously described.

9. STARTER MOTOR

Special Equipment Required:

To Renew Brushes – Soldering Iron

DESCRIPTION

A Bosch starter motor is installed to the engine. The starter motor is of the induced pole type with four brushes and four pole shoes with field coils.

A solenoid switch is attached to the starter drive end bracket. The solenoid plunger is connected to the over-running clutch and drive pinion assembly through a link, lever and pivot pin arrangement.

When the solenoid windings are energised, the plunger acting on the lever and pivot engages the drive pinion with the flywheel ring gear, and at the same time, closes the switch supplying power from the positive lead of the battery to the starter motor field coils to operate the motor.

As the engine fires, the over-running clutch of the drive pinion assembly prevents high speed rotation of, and possible damage to the starter armature if the solenoid windings are not immediately de-energised by releasing the key switch on the combined ignition/starter switch.

TO TEST ON THE VEHICLE

Should the starter fail to operate when the switch is moved to the start position, check the following points:

(1) Check the battery condition and state of charge, refer to the Battery heading.

(2) Clean the battery terminals taking particular care to remove the scale from both terminals and the posts.

(3) Check the earth connections for tightness and cleanliness.

(4) Switch on the headlamps and operate the starter control switch. If the lights go dim but the starter is not heard to operate, it could indicate that a short circuit or high resistance has developed in the starting system which could be either external or internal.

Also check that the engine is not 'seized' or 'locked up' as this condition would give the same indication as above.

(5) If the lamps do not go dim and the starter does not operate this would indicate an open circuit such as a broken or disconnected wire or a switch not operating. If the vehicle is fitted with automatic transmission operate the starter control switch and move the selector lever through all the gear selection range. If the starter operates in any position other than N or P, the neutral safety switch is faulty.

(6) Check all the external wiring to make sure the fault is not external, if the external circuit proves satisfactory, indicating that the problem is in the starter assembly, the unit will have to be removed and bench checked.

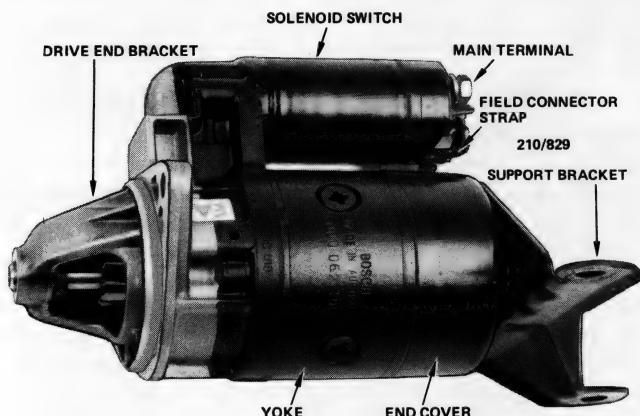
TO REMOVE AND INSTALL**Manual Transmission Models**

- (1) Raise the engine bonnet and disconnect the negative battery terminal.
- (2) Remove the starter motor upper retaining bolt and push the clutch cable support bracket out of the way.
- (3) Raise the front of the vehicle and support on chassis stands as described in the Wheels and Tyres section.
- (4) Working beneath the vehicle, remove the bolts retaining the front exhaust pipe support bracket to the transaxle and swing the support bracket downwards.
- (5) Disconnect the electrical leads from the solenoid switch main terminal post and the lead from the spade terminal.
- (6) Remove the bolts retaining the starter motor support bracket to the cylinder block taking note of the position of the two earth leads secured by the top bolt.
- (7) Disconnect the wiring loom and the wiring loom retaining clip from the starter motor support bracket.
- (8) Remove the starter motor lower retaining bolt and manoeuvre the starter motor from the engine in a downwards direction.

Installation is a reversal of the removal procedure.

Automatic Transmission Models

- (1) Raise the engine bonnet and disconnect the negative battery terminal.
- (2) Raise the front of the vehicle and support on chassis stands as described in the Wheels and Tyres section.
- (3) Place a suitable drain tin beneath the heater unit hoses and disconnect the heater unit return hose from the heater unit tube.
- (4) Disconnect the speedometer cable from the transaxle.
- (5) Disconnect the electrical leads from the solenoid switch main terminal post and the lead from the spade terminal.



View of starter motor assembly.

- (6) Remove the starter motor lower retaining bolt.
- (7) Remove the bolts retaining the starter motor support bracket to the cylinder block taking note of the position of the two earth leads secured by the upper bolt.
- (8) Disconnect the wiring loom retaining clip from the starter motor support bracket.
- (9) Remove the starter motor upper retaining bolt and the two brackets retained by that bolt. Withdraw the starter motor from the engine in a upwards direction.

Installation is a reversal of the removal procedure.

TO DISMANTLE

- (1) Mount the starter motor in a vice after removing it from the vehicle as previously described.
- (2) Disconnect the field connector strap from the lower terminal on the solenoid switch.
- (3) Remove the two solenoid retaining screws from the drive end bracket. Withdraw the solenoid from the drive end bracket a short distance then lift the solenoid plunger off the top of the pinion engaging fork.
- (4) Remove the two bearing cap retaining screws and remove the cap and seal from the commutator end cover.
- (5) Remove the 'C' clip and thrust washers from the end of the armature shaft, noting the number of washers installed.
- (6) Remove the two through bolts, remove the support bracket and separate the commutator end cover from the yoke.
- (7) Withdraw the yoke and field coil assembly together with the brush holder and brushes from the armature and drive end bracket.
- (8) Remove the sealing block from the drive end bracket and withdraw the armature and the pinion engaging fork from the drive end bracket.
- (9) Carefully spread the pinion fork arms and disconnect the pinion fork arms from the drive pinion dowels. Remove the pinion fork.
- (10) Support the armature in a vertical position with the drive pinion uppermost.
- (11) Using a suitable drift, tap the stop collar towards the drive pinion and clutch assembly and remove the circlip from the armature shaft.
- (12) Remove any burrs from the shaft and withdraw the stop collar and the drive pinion and clutch assembly from the armature shaft.
- (13) Clean all parts thoroughly but do not immerse the yoke, armature or drive clutch in cleaning solvent.
- (14) If the field coils are to be removed mark the location of each individual pole shoe before removing the mounting screws.

NOTE: Do not remove the field coils unless they are suspected of being unserviceable. The pole shoes must be replaced in the same position from which they were removed to avoid the possibility of the armature poling when the starter motor is assembled.

TO CHECK AND INSPECT

(1) With the starter motor dismantled check the brush holder insulation using an ohmmeter.

Connect one test lead on the brush holder positive side and the other lead on the negative side. If there is any indication of leakage the ohmmeter will show a reading other than infinite. Repair or renew the brush holder if a short circuit is evident.

(2) Check the brushes for adequate length. Brushes should be renewed when their length is below Specifications. They should be a free sliding fit in the brush holders.

(3) Check the brush springs, and compare with new springs.

(4) Check that the commutator is free from pitting and burning, clean with a petrol moistened cloth and polish with a strip of fine glass paper.

A badly worn commutator may be cleaned up by mounting in a lathe, spinning at high speed, and a light cut taken with a very sharp tool. After turning, undercut the insulation between the segments.

(5) Check the armature for short circuit, using a ohmmeter. Place one of the test leads on the armature shaft or core and move the other lead around the circumference of the commutator. If the ohmmeter shows a reading at any point the armature is faulty and should be renewed.

(6) Test the field coils for continuity by connecting the test leads in series with the field windings.

Failure of the ohmmeter to show a reading indicates an open circuit in the wiring of the field coils.

(7) Check the field coils for ground by placing one test lead on the field coil lead and the other lead on the yoke. If the ohmmeter shows a reading the field coils and yoke assembly are faulty and will have to be renewed.

(8) Check the drive assembly clutch pinion teeth for wear, scoring or chipping. A clutch in good condition should take up the drive in one direction only. It should rotate easily and smoothly in the non-drive direction and

the assembly should move smoothly along the armature helical splines.

NOTE: Do not wash the drive assembly or clutch in solvent as this will destroy the clutch lubricant and cause early failure of the unit.

(9) Check the armature shaft bushes for wear and renew as necessary. The old bushes must be removed and the new ones pressed into the end brackets using a polished mandrel of the exact diameter of the armature shaft.

NOTE: The new bushes must not be reamed to size, as reaming will impair the porosity of the bushes and cause early failure. New bushes should be allowed to stand immersed in clean light engine oil for one hour before fitting.

TO ASSEMBLE

Assembly is a reversal of the dismantling procedure with attention to the following points:

(1) Lubricate the helix on the armature shaft lightly with molybdenum disulphide grease and fit the drive pinion and clutch assembly to the armature shaft.

(2) Fit the stop collar and circlip, slide the stop collar over the circlip to lock the clip in position.

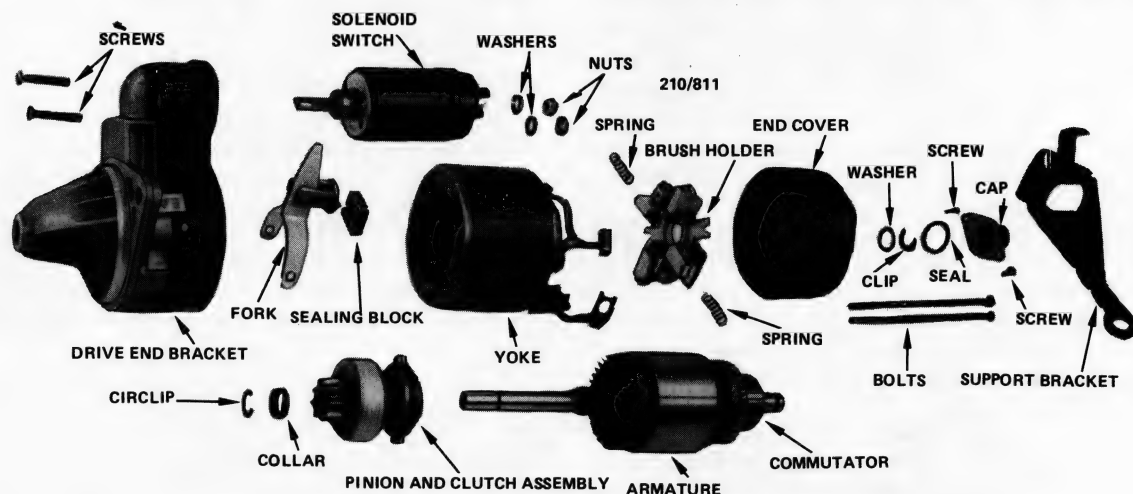
(3) Lubricate the bearings in both end brackets sparingly with engine oil.

(4) Position the armature together with the engaging lever into the drive end bracket and fit the dust seal to the drive end bracket.

(5) Engage the solenoid switch and lever and instal the solenoid with the battery (longer) terminal at the rear uppermost. Secure the solenoid with the retaining screws.

(6) Fit the yoke over the armature and the brush holder and brushes over the commutator.

To instal the brush holder with brushes fitted it is necessary to push the brushes against the spring tension



Dismantled view of starter motor.

into the holder and then slide the assembly onto the commutator.

NOTE: When new brushes are installed, place the brush holder over the commutator, insert the brushes and springs and then bend over the brush spring retaining lugs.

(7) Fit the commutator end cover and the two through bolts. Ensure that the field connector strap and insulator are seated correctly.

(8) Instal the thrust washers to the end of the armature shaft and secure them with the 'C' clip. Adjust the armature end-float by adding or subtracting thrust washers. Refer to Specifications.

(9) Place the bearing cap and gasket over the armature shaft and instal the retaining screws.

Instal both screws loosely before tightening.

(10) Connect the field connector strap to the lower terminal on the solenoid switch and tighten the nut.

10. ELECTRONIC IGNITION SYSTEM

Special Equipment Required:

To Test - 0-60-0 ammeter, voltmeter

To Remove Trigger Vane Rotor - Suitable puller

DESCRIPTION

The medium energy electronic ignition system consists of a distributor, control unit, pulse generator, ignition coil and associated wiring.

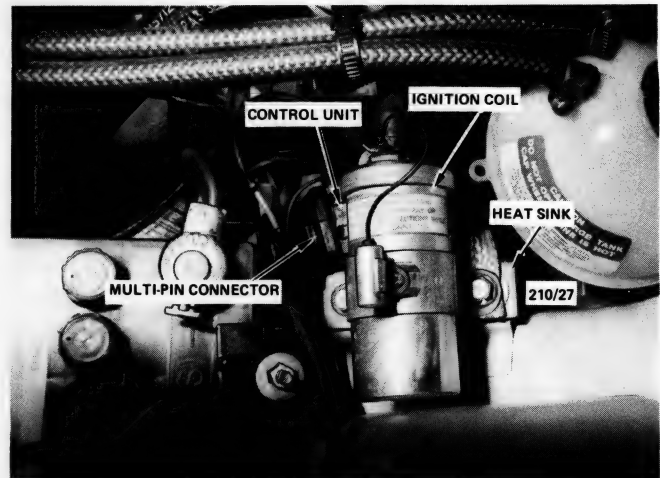
The distributor is basically the same as that in conventional ignition systems. The difference lies in the fact that the capacitor and breaker points are not used. These are replaced by a pulse generator which consists of a trigger vane rotor, which rotates with the distributor shaft, and a Hall sensor mounted on the distributor base plate. The Hall sensor in turn consists of a Hall effect integrated circuit and a permanent magnet. The trigger vane rotor rotates in between the integrated circuit and the magnet. As there is no contact between the moving parts of the pulse generator, the system is virtually maintenance free.

Ignition advance is achieved by the same methods used in a conventional distributor, i.e. centrifugal weights and a vacuum advance unit.

The system is fitted with a temperature controlled ported vacuum switch, which allows ignition advance at idle rpm during overheat conditions.

The width of the rotor trigger vanes control the dwell angle and as these widths are predetermined the dwell angle is not adjustable and can only be measured by an oscilloscope.

The electronic control unit is a sealed non-adjustable electronic component which determines, with the aid of the Hall voltage from the Hall effect generator, the period during which current will flow in the primary circuit.



Installed view of ignition coil, control unit and heat sink.

The ignition coil is specially designed to suit this ignition system and should never be replaced by a unit not matched to this ignition system.

Some types of tachometers and timing lights are unsuited to solid state ignition systems. Always ensure that suitable testing equipment is used.

ELECTRICAL CHECKS

NOTE: Solid state ignition systems can produce dangerous high tension voltages in both the primary and secondary circuits. For this reason extreme care must be taken when carrying out these checks. When disconnecting the wiring plug from the engine wiring harness ensure that the ignition switch is in the OFF position. This will prevent damage to the solid state circuitry in the control unit.

Should engine problems arise and the ignition system be suspect first ensure the ignition system components are clean and dry, and all terminals are secure. Ensure the battery is fully charged and the ignition timing is correctly set.

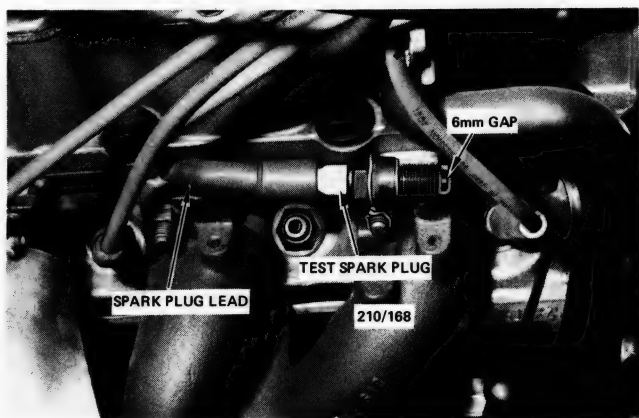
If after checking the previous points the engine will not start carry out the following tests:

(1) Open the electrode gap on an old spark plug to 6 mm. Securely earth the body of this spark plug using a jumper lead or by tying the plug to an earthed engine component. Remove a spark plug lead and connect it to the test plug.

(2) Have an assistant operate the starter motor.

(3) Check that a spark, if any, jumps the gap on the test plug. If there is a good spark on the test plug, check the spark plugs in the engine. If there is no spark carry on with point (4).

(4) Disconnect the coil lead from the distributor cap and carry out, on the coil lead, the check procedure previously described for the spark plug. If there is a strong spark, then the fault probably lies in the distributor cap, rotor arm or spark plug leads. Carefully inspect these components for cracks or loose terminals.



Securely earth the body of a test spark plug to check for sparks at the spark plug.

(5) If no spark exists, visually check the ignition coil for oil leakage. If the coil is leaking it must be replaced with a new unit of the correct type. Also replace the electronic control unit.

NOTE: When installing a new or used control unit to the heat sink ensure that both contact surfaces are clean, then apply a silicon heat sink compound to the control unit contact surface.

(6) If still no high tension spark exists turn off the ignition and disconnect the multi-terminal connector from the electronic control unit. Connect a voltmeter between terminal 4 and terminal 2 on the multi-terminal connector of the wiring loom. (See diagram).

NOTE: Terminal 2 on the electronic control unit is earth, take care when connecting the voltmeter and use correct polarity.

(7) Turn on the ignition but do not crank the engine, the voltmeter should read 11 volts or more. If not turn off the ignition and check the wires and wire connec-

tors for continuity from the ignition switch to terminal 4 on the multi terminal connector, also check the earth wire from terminal 2.

NOTE: All terminal numbers quoted are printed on the electronic control unit.

(8) If the voltmeter reading is 11 volts or more turn off the ignition, disconnect the voltmeter, and reconnect the voltmeter to terminals 1 and 2 on the electronic control unit connector.

(9) Turn on the ignition and the voltmeter should again read 11 volts or more. If not then voltage drop must be rectified before proceeding.

(10) Turn off the ignition and leave the multi-terminal connector disconnected from the control unit. Disconnect the three wire connector from the distributor.

(11) With an ohmmeter check for continuity at the wire (colored brown) between terminal 6 on the control unit loom plug and the (0) terminal on the distributor plug. Repeat this check for the wire (colored tan) between terminal 5 and the (+) terminal on the distributor plug and the wire (coloured light green) between terminal 3 and the (-) terminal on the distributor plug. Renew any defective wires if necessary.

(12) If the engine refuses to start after these checks and the necessary repairs have been carried out, replace the control unit followed by the distributor if necessary.

(13) If the engine still will not start then a mechanical defect must exist elsewhere in the vehicle.

DISTRIBUTOR

To Remove and Instal

- (1) Disconnect the negative battery terminal.
- (2) Disconnect the wiring loom connector from the distributor.
- (3) Remove the distributor cap and after noting the position of No 1 spark plug terminal post lay it aside.
- (4) Disconnect the vacuum hose from the vacuum advance unit on the distributor.

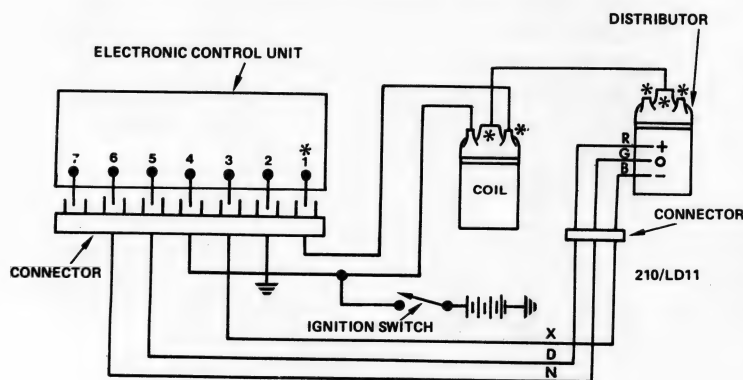
(5) Turn the engine in the direction of rotation until the tdc timing marks on the oil pump housing and on the crankshaft pulley are in line, and the rotor arm is pointing to the small groove in the top edge of the distributor body.

(6) Mark the distributor body to camshaft housing relationship to aid in resetting the ignition timing on installation.

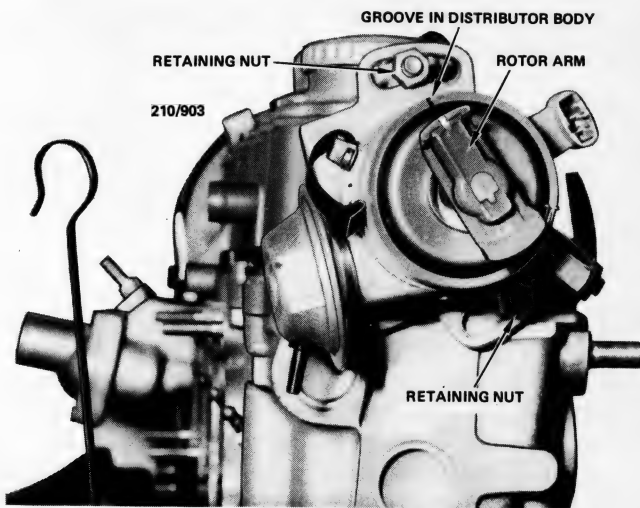
(7) Remove the distributor retaining nuts and washers and remove the distributor with a twisting motion out of the camshaft housing.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Check that the engine has not been turned while the distributor has been removed. If the engine has been turned check that the timing marks are again brought into line and that No 1 piston is on the compression stroke.

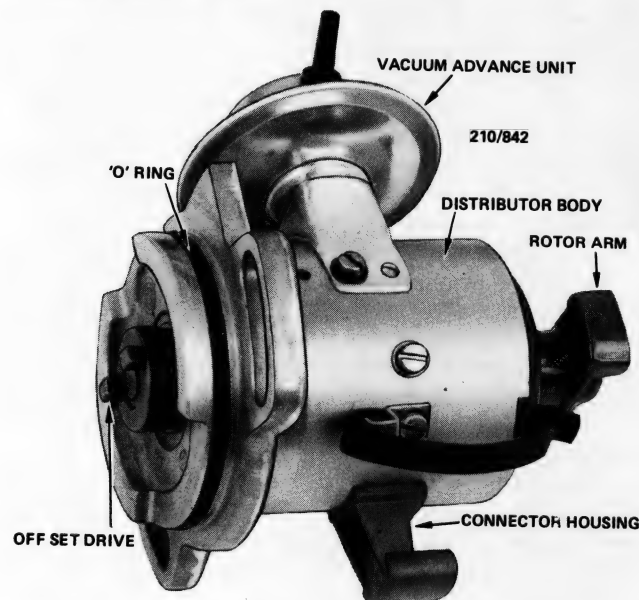


Schematic diagram of high energy ignition system. Note high voltages occur at terminals marked with an asterisk Color code. R = red, G = green, B = black, X = light green, D = tan and N = brown.



Installed view of distributor assembly with rotor arm pointing to the position of No 1 spark plug terminal post.

- (2) Check the distributor base 'O' ring and renew if in doubt as to its serviceability.
- (3) Position the rotor arm to align with the small groove in the top edge of the distributor body and instal the distributor, ensuring the drive tangs on the distributor are correctly engaged with the slots in the camshaft.
- (4) Align the distributor body and the camshaft housing marks made prior to removal and loosely instal the distributor retaining washers and nuts.
- (5) Connect the distributor terminal to the wiring loom connector and instal the vacuum hose to the vacuum unit.
- (6) Instal the distributor cap and leads and connect the negative battery terminal.
- (7) Set the ignition timing as described in the Engine Tune-up section and securely tighten the distributor retaining nuts.



View of distributor assembly removed from the engine.

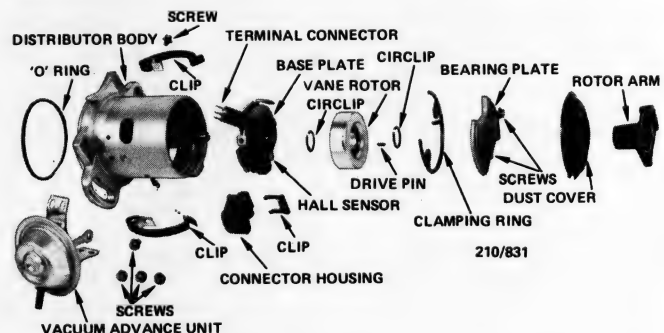
To Dismantle

- (1) Remove the distributor as previously described.
- (2) Remove the rotor arm and the dust cover.
- (3) Rotate the distributor shaft by hand and check that the trigger vane rotor does not make contact with the components of the Hall sensor. Check for metal chips or dust that may be bridging the air gap of the Hall sensor.
- (4) Remove the 'O' ring from the base of the distributor.
- (5) Loosen the upper bearing plate retaining screws and remove the bearing plate and screws.
- (6) Using suitable circlip pliers squeeze the ends of the clamping ring together and remove the clamping ring.
- (7) Remove the clip retaining the electrical connector housing to the distributor body.
- (8) With the electrical connector housing pushed against the distributor body, grip the centre terminal of the electrical connector inside the housing with suitable long nose pliers and push the electrical connector out of the housing. Remove the housing from the distributor body.
- (9) Remove the screws retaining the distributor cap securing clips and remove the clips and the screws from the distributor body.
- (10) Remove the vacuum advance unit mounting screws, lift the connecting link off the locating pin on the base plate and remove the vacuum unit from the distributor.
- (11) Remove the circlip and if fitted the wave washer retaining the trigger vane rotor to the distributor shaft.
- (12) Using a suitable puller, with the legs of the puller hooked into the slots of the trigger vane rotor, remove the trigger vane rotor from the distributor shaft.

NOTE: Take care not to lose the small locating pin fitted between the trigger vane and the distributor shaft.

- (13) Remove the circlip retaining the base plate and Hall sensor assembly to the distributor shaft and remove the assembly from the distributor body.

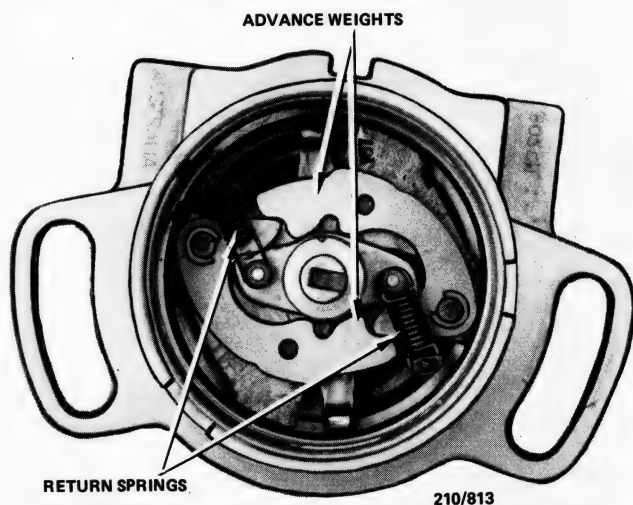
- (14) Further dismantling of the distributor is not necessary unless the bush is worn or the body had been damaged.



Dismantled view of distributor components.

To Inspect

- (1) Visually inspect the Hall sensor assembly leads and connector terminals for damage or fractures. Check that a 1 mm air gap exists between the permanent magnet and the Hall effect integrated circuit.
- (2) Inspect the trigger vane rotor for damage. Renew if necessary, make no attempt to repair.
- (3) Check that the centrifugal advance weights are not binding on the pivot pins.
- (4) Inspect the distributor cap for cracks, tracking or corroded terminals.
- (5) Check the centre carbon brush in the cap for wear. The carbon brush should protrude sufficiently to contact the rotor arm.
- (6) Inspect the rotor arm for cracks, damage or wear.
- (7) Check the vacuum advance unit for a leaking diaphragm by sucking on the vacuum hose connection and noting if the unit maintains vacuum.



Top view of distributor with base plate removed.

To Assemble

Assembly is a reversal of the dismantling procedure with attention to the following points:

- (1) Lubricate all friction surfaces sparingly with a lithium based grease at the same time taking care to keep all grease or foreign matter away from the Hall sensor assembly.
- (2) Instal the base plate and Hall sensor assembly to the distributor body guiding the electrical connector through the opening of the distributor body.
- (3) Temporarily instal two base plate retaining screws.
- (4) Instal the vacuum advance unit to the distributor body, connect the linkage to the base plate pivot pin and loosely instal one retaining screw to the vacuum hose connection side of the vacuum unit.
- (5) Align the small lug on the electrical connector with the slot in the electrical connector housing and snap the two components together.

- (6) Push the connector housing with the connector into the distributor body and instal the retaining clip.
- (7) Instal the base plate retaining circlip to the distributor shaft groove.
- (8) Before installing the trigger vane rotor ensure that no damage to the trigger vane rotor occurred during removal. Renew it necessary.
- (9) Place the trigger vane rotor locating pin into the distributor shaft groove and, using a suitable tubular drift, press the trigger vane rotor onto the distributor shaft by pressing on the centre area of the rotor only.
- (10) If a wave washer is fitted instal the wave washer to the top of the rotor followed by the installation of the circlip into the distributor shaft groove.
- (11) Instal the distributor cap securing clips, instal the remaining vacuum advance unit, base plate and distributor cap retaining screws and tighten securely.
- (12) Instal the clamping ring and the upper bearing plate. Instal the upper bearing plate retaining screws and tighten securely.
- (13) Instal the dust cover and the rotor arm to the distributor.
- (14) Instal the distributor to the engine as previously described.

11. SWITCHES AND CONTROLS

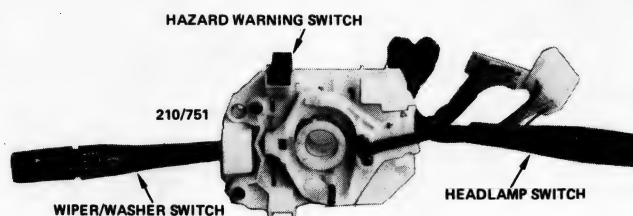
IGNITION SWITCH

To Remove and Instal

- (1) Disconnect the negative battery terminal.
 - (2) Remove the lower trim panel and the air ducts near the steering column.
 - (3) Remove the small screw retaining the ignition switch to the rear of the steering column bearing support bracket and withdraw the switch from the bracket.
 - (4) Disconnect the switch wire connector from the wiring loom and remove the switch.
- Installation is a reversal of the removal procedure.

COMBINATION SWITCH

The combination switch on the steering column incorporates the turn signal switch, windscreen wiper/washer switch, headlamp/park lamp switch and the hazard warning switch. Also incorporated in the combination switch is the horn rubbing contact. The combination switch is renewed as a complete unit.



View of combination switch.

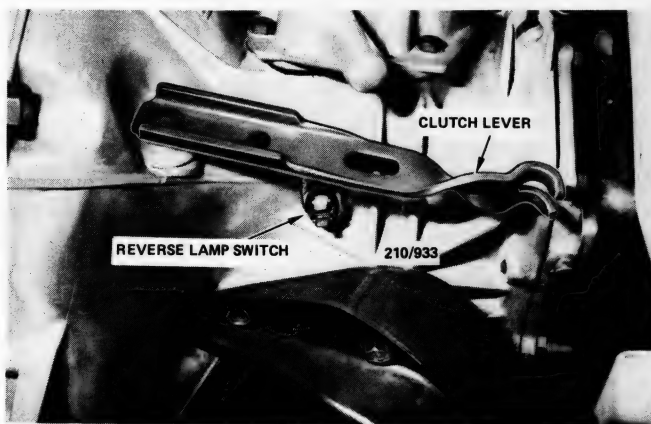
To remove and instal the combination switch refer to the Steering section under the heading – Steering Column.

REVERSE LAMP SWITCH

To Test

On vehicles fitted with automatic transaxle a combined neutral safety and reverse lamp switch is fitted. Test, removal and installation procedures are detailed in the automatic transaxle section. On vehicles fitted with manual transaxle proceed as follows:

- (1) Disconnect the switch wiring at the connectors.
- (2) Unscrew the switch from the transaxle.



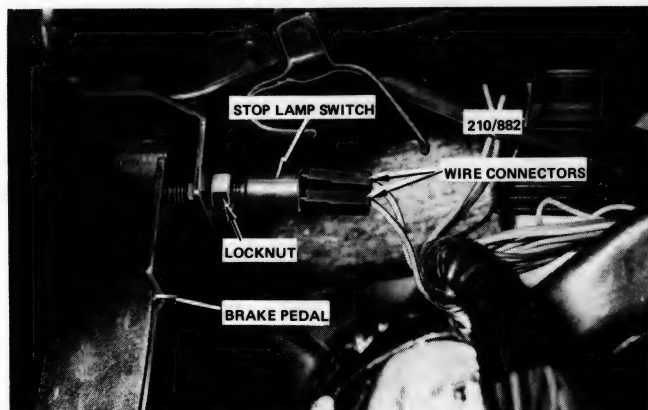
Installed view of reverse lamp switch.

- (3) Connect an ohmmeter across the two wire connectors on the switch.

- (4) Press the switch plunger to test for continuity. If continuity is not present when the switch plunger is pressed or continuity is present when the switch plunger is released, renew the switch.

STOP LAMP SWITCH

The stop lamp switch is a mechanical type switch mounted under the dashboard at the top of the brake pedal.



Installed view of stop lamp switch.

To Test

- (1) Before any attempt is made to test the switch, check the brake pedal height as described in the Brake Section.

- (2) If the stop lamps fail to light when the brake pedal is depressed and the ignition is switched on, remove the lower trim panel, the wiring at the connectors and connect a bridging wire between the two harness wires.

- (3) If the stop lamps now operate when the ignition is switched on, the switch is faulty and should be renewed.

To Renew

- (1) If not removed previously, remove the lower trim panel and disconnect the switch wiring at the connectors.

- (2) Loosen the switch locknut and unscrew the switch from the bracket.

Installation is a reversal of the removal procedure with attention to the following point:

To adjust the stop lamp switch, hold the pedal down 16 mm and turn the stop lamp switch in the required direction until the stop lamps come on. Release the pedal and check that the lamps switch off. Tighten the locknut on the stop lamp switch.

HANDBRAKE WARNING LAMP SWITCH

To Renew

- (1) Remove the handbrake lever assembly as described in the Brakes section.

- (2) Disconnect the switch connector and remove the switch.

As the handbrake warning lamp switch wiring runs beneath the carpet and is connected to the body harness behind the dashboard it may prove more convenient to cut the wire near the switch and join the wiring of the new switch using a suitable insulated connector.

- (3) Fit the new switch to the handbrake lever and



Installed view of handbrake warning lamp switch. Centre console removed.

instal the lever assembly to the vehicle as described in the Brakes section.

- (4) Adjust the handbrake as necessary.

INSTRUMENT LAMP RHEOSTAT

To Remove and Instal

- (1) Disconnect the negative battery terminal.
- (2) Remove the screws retaining the lower right hand side trim panels to the instrument panel and remove the trim panels.
- (3) Pull the knob off the rheostat switch spindle.
- (4) Working under the instrument panel behind the rheostat switch, depress the plastic lock tang on the electrical connector and remove the connector from the switch.
- (5) Remove the round retaining nut from the front of the switch and withdraw the switch from the instrument panel.

Installation is a reversal of the removal procedure ensuring that the locating lug on the switch is correctly positioned in the instrument panel slot before tightening the round retaining nut.

REAR WINDOW DEMISTER SWITCH

To Remove and Instal

- (1) Disconnect the negative battery terminal.
- (2) Remove the screws retaining the lower trim panel beneath the steering column.
- (3) Remove the bolts retaining the steering column upper mounting to the mounting bracket and lower the steering column.
- (4) Remove the screws retaining the instrument cluster panel to the instrument panel and to the instrument cluster hood.
- (5) Withdraw the instrument cluster panel enough to gain access and disconnect the demister switch electrical connector from the rear of the switch.
- (6) Push the switch locating tangs towards the switch and remove the switch from the instrument cluster panel.

Installation is a reversal of the removal procedure.

COURTESY LAMP DOOR SWITCH

The door safety indicator lamp where fitted, is also activated from the courtesy lamp door switches which are operated by an open or a partially opened door.

To Test

- (1) Ensure that the courtesy lamp switch is in the DOOR position.
- (2) Prise the rubber stop from the vehicle body and unscrew the door switch from the vehicle body.
- (3) Check that the switch button slides freely in and out of the switch body.

- (4) Connect the wire to a suitable body earth. If the lamp lights, the switch is faulty.

GLOVE COMPARTMENT LAMP SWITCH

To Remove and Instal

- (1) Disconnect the negative battery terminal.
 - (2) Open up the glove compartment and unscrew the switch from its mounting bracket ensuring not to lose the threaded mounting clip.
 - (3) Disconnect the switch wiring connector and remove the switch from the glove compartment.
- Installation is a reversal of the removal procedure.

LUGGAGE COMPARTMENT LAMP SWITCH

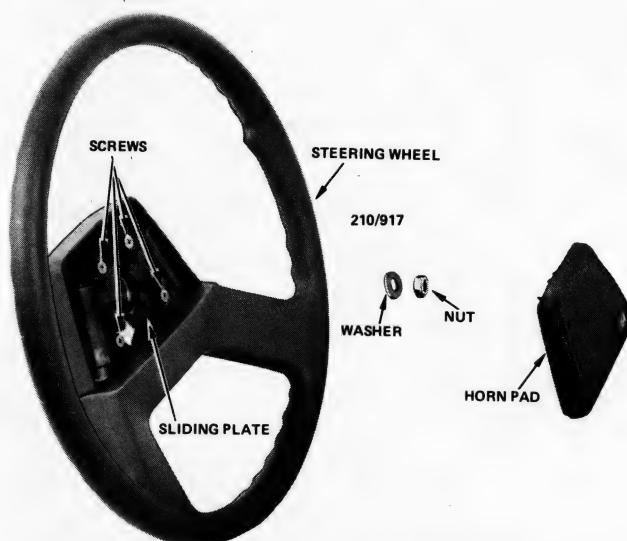
To Remove and Instal

- (1) Disconnect the negative battery terminal.
 - (2) Open up the luggage compartment lid and where fitted remove the trim panel from near the right hand side luggage compartment lid hinge.
 - (3) Remove the screw retaining the switch to the body panel bracket and remove the switch from the bracket.
 - (4) Disconnect the electrical connector from the switch and remove the switch from the vehicle.
- Installation is a reversal of the removal procedure.

HORN PAD

The horn pad on top of the steering wheel is mounted on a sliding metal plate which is secured by insulated screws. Contact of the metal plate with the centre of the steering wheel is prevented by the pressure of an insulated spring.

Pressing the horn pad overrides the spring pressure, connecting the mounting plate with the earthed centre of the steering wheel, thereby closing the electrical circuit and activating the horn.



View of steering wheel and associated components.

TURN SIGNAL LAMP FLASHER UNIT

To Renew

The turn signal flasher unit is located under the dash, slightly to the right of the steering column and near to where the speedometer cable is connected to the Speedometer.

- (1) Remove the lower trim panel from the instrument panel.
- (2) Extend one hand up and under the dash panel, grip the flasher unit and slide it off the mounting bracket towards the steering wheel.
- (3) Lower the flasher unit together with the wire connector.
- (4) Disconnect the wiring connector from the flasher unit and remove the flasher unit from the vehicle.

Installation is a reversal of the removal procedure.

12. LAMP UNITS

COMBINATION HEADLAMP, PARK LAMP AND TURN SIGNAL LAMP ASSEMBLY

To Renew Headlamp Bulb and Park Lamp Bulb

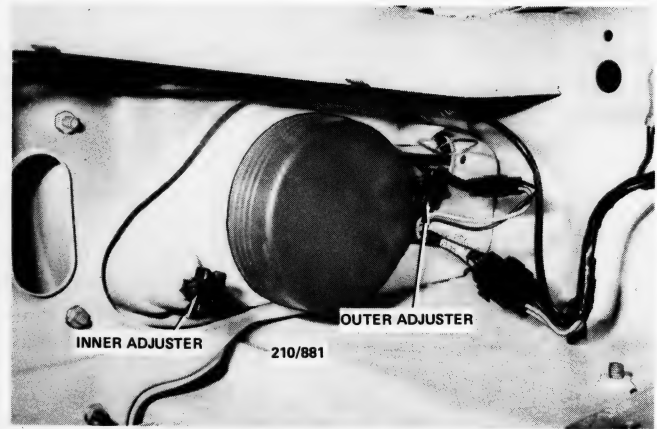
- (1) Working inside the engine compartment remove the dust cap on the rear of the lamp unit by rotating anti-clockwise.
- (2) Disconnect the headlamp bulb and the park lamp bulb connector.
- (3) Rotate the bulb retainer anti-clockwise and withdraw the bulb and bulb retainer from the lamp unit.
- (4) The headlamp bulb and park lamp bulb may now be serviced.

NOTE: Extreme care should be taken not to touch the glass of the halogen bulb, otherwise the bulb will blow when the lamp is switched on. If the glass surface of the bulb is touched during removal or installation it should be washed clean in methylated spirits.

- (5) Carefully instal the bulb and bulb retainer to the headlamp body. Secure the retainer by rotating it clockwise then refit the headlamp bulb and the park lamp bulb connector.
- (6) Instal the dust cap on the headlamp body and secure by rotating clockwise.
- (7) Check the operation of the headlamp and park lamp and if necessary adjust the headlamp as described under the following heading.

To Adjust Headlamps

- (1) Make sure that the tyres are inflated to their correct pressure.
- (2) Position the vehicle on level ground and in relation to the test equipment being used.
- (3) Switch on the headlamps and dip to low beam.



Rear view of right hand headlamp assembly showing location of headlamp adjusters.

- (4) To raise or lower the headlamp beam the inner adjuster is used.
- (5) To move the beam to the left or right, the outer adjuster is used.
- (6) When using a headlamp aiming board cover the lamp not being adjusted so that only one beam is projected onto the board.

NOTE: Reference should be made to the local regulations governing headlamp focus and the lamps should be focused accordingly.

To Renew Front Turn Signal Lamp Bulb

- (1) Remove the two screws retaining the turn signal lamp lens to the lamp body and remove the lens taking care not to break the lens seal.
- (2) Remove the bulb by pushing in slightly and turning anti-clockwise.

- (3) Installation of the bulb and lens is a reversal of the removal procedure ensuring that the lens seal is not dislodged from the lamp body and the new bulb fitted is of the correct wattage and voltage.

To Remove and Instal Headlamp Assembly

- (1) Disconnect the negative battery terminal.
- (2) Working inside the engine compartment disconnect the multi-pin plug to the headlamp assembly.
- (3) Remove the nuts retaining the headlamp assembly to the vehicle body. If removing the left hand side headlamp assembly, it will be necessary to remove the battery first to gain access to the headlamp assembly retaining nuts.
- (4) Withdraw the headlamp assembly from the vehicle at the same time lifting the assembly clear of the bumper bar.

Installation is the reversal of the removal procedure with attention to the following point:

Check and if necessary adjust the headlamp as previously described.

To Dismantle and Assemble Headlamp

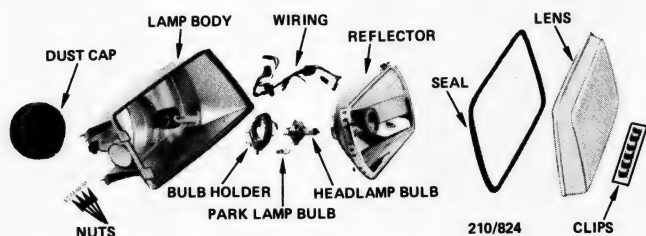
(1) Remove the headlamp assembly from the vehicle as previously described and disconnect the wire to the turn signal lamp.

(2) Unhook the turn signal lamp retaining spring from the headlamp assembly bracket.

(3) Separate the turn signal lamp from the headlamp assembly.

(4) Remove the bulb and bulb holder from the headlamp assembly as previously described.

(5) Unclip the lens retaining clips. To remove the lens retaining clips prise the clips off the headlamp body, NOT the lens side.



Dismantled view of headlamp assembly.

(6) Carefully prise the lens and lens seal off the lamp body.

(7) Remove the screw retaining the reflector pivot to the lamp body.

(8) Unhook the reflector from the adjusting screws and remove the reflector.

Installation is a reversal of the removal procedure with attention to the following points:

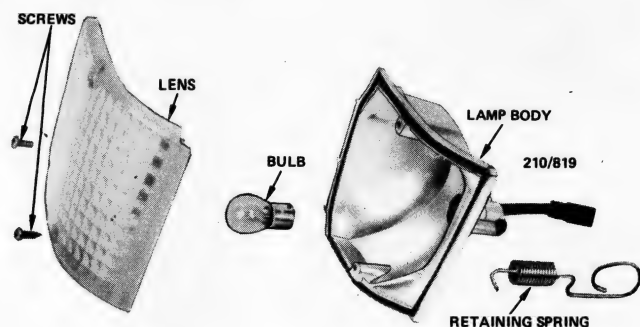
(1) Ensure that the headlamp lens seal is correctly installed to the lamp body to prevent entry of dust and moisture into the lamp assembly.

(2) Check and if necessary adjust the headlamp as previously described.

To Remove and Instal Turn Signal Lamp

(1) Working inside the engine compartment disconnect the wire connector to the turn signal lamp.

(2) Unhook the turn signal lamp retaining spring from the headlamp bracket.



Dismantled view of turn signal lamp.

(3) Withdraw the turn signal lamp from the vehicle towards the front.

Installation is the reversal of the removal procedure.

REAR COMBINATION LAMP**To Remove and Instal Bulbs**

(1) Raise the luggage compartment lid and where fitted remove the luggage compartment side trim panel and the lamp body cover.

(2) Turn the relevant bulb holder anti-clockwise and remove the bulb holder and the bulb from the lamp body.

(3) Remove the bulb from the bulb holder by pushing the bulb slightly in and turning anti-clockwise.

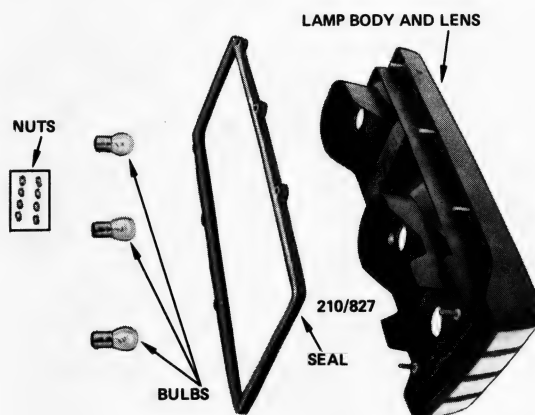
(4) Instal the new bulb, ensure that it is of the correct wattage and voltage. If replacing a stop/tail lamp bulb ensure that it is fitted correctly, as the locating pins on the bulb are off set.

(5) Refit the bulb and bulb holder to the lamp body and turn the bulb holder clockwise to correctly engage with the lamp body.

(6) Refit the trim where removed and check the operation of the lamps.

To Remove and Instal Rear Combination lamp

(1) Raise the luggage compartment lid and where fitted remove the trim panel and lamp cover.



View of rear combination lamp.

(2) Note the installed position of the bulb holders and turn the bulb holders anti-clockwise to remove them from the lamp body.

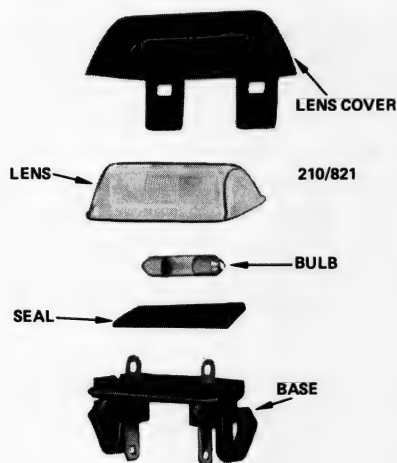
(3) Remove the nuts retaining the lamp assembly to the vehicle body.

(4) Remove the lamp assembly and seal from the vehicle in a rearward direction.

Installation is a reversal of the removal procedure with attention to the seal between the lamp and the rear panel to avoid entry of dust or water into the luggage compartment.

NUMBER PLATE LAMP**To Remove and Instal Bulb or Lamp**

- (1) Disconnect the negative battery terminal.
- (2) Using a suitable screwdriver carefully prise the number plate lamp from the bumper bar.
- (3) Prise the lens cover off the lamp base and lift the lens from the base.
- (4) Remove the bulb from the bulb holder.
- (5) If the lamp is to be removed from the vehicle, disconnect the wires from the lamp terminals and remove the lamp from the vehicle.

**Dismantled view of number plate lamp.**

Installation is a reversal of the removal procedure with attention to the following point:

Ensure that the new bulb is of the correct wattage and voltage.

COURTESY LAMP**To Renew Bulb**

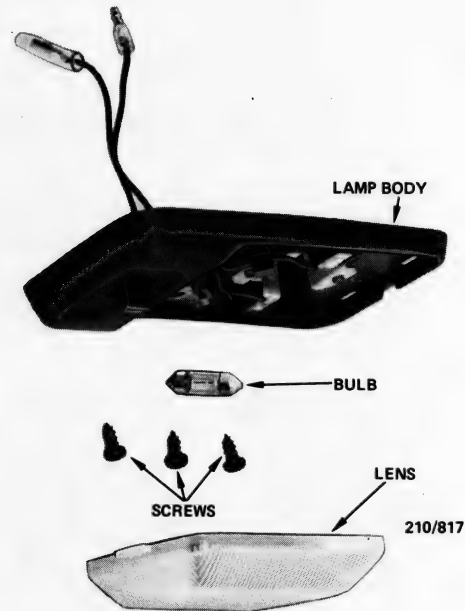
- (1) Gently prise the courtesy lamp lens from the lamp assembly.
- (2) Grip the bulb, push back one contact and remove the bulb from the lamp assembly.

Installation is a reversal of the removal procedure, ensuring that the bulb holder is free from corrosion.

To Remove and Instal Lamp

- (1) Disconnect the negative battery terminal.
- (2) Gently prise the courtesy lamp lens from the lamp assembly.
- (3) Remove the screws retaining the lamp assembly to the roof bracket.
- (4) Lower the lamp assembly, disconnect the wire connectors and remove the lamp assembly from the vehicle.

Installation is a reversal of the removal procedure with attention to the following point:

**Dismantled view of courtesy lamp.**

Ensure that no wires are caught in between the lamp base and the roof bracket when installing the lamp assembly.

GLOVE COMPARTMENT LAMP**To Renew Bulb**

- (1) Disconnect the negative battery terminal.
- (2) Open the glove compartment lid and with a small screwdriver carefully prise the lamp assembly from the glove compartment panel.
- (3) Grip the bulb, push back one bulb contact and remove the bulb from the lamp assembly.

Installation is a reversal of the removal procedure.

LUGGAGE COMPARTMENT LAMP**To Renew Bulb**

- (1) Disconnect the negative battery terminal.
- (2) Open up the luggage compartment lid and using a small screwdriver carefully prise the lamp assembly from the compartment top panel.
- (3) Grip the bulb, push back one bulb contact and remove the bulb from the lamp assembly.

Installation is a reversal of the removal procedure.

13. INSTRUMENT CLUSTER**TO REMOVE AND INSTAL**

- (1) Disconnect the negative battery terminal.
- (2) Remove the screws retaining the lower trim panel to the instrument panel and remove the lower trim panel.

Remove the screws retaining the centre lower steering

column cover, disconnect the ducting and remove the lower cover from the dash.

(3) Remove the bolts retaining the steering column to the mounting brackets and lower the steering column.

(4) Extend one hand up and under the dash, depress the speedometer cable locking tab and disconnect the speedometer cable from the speedometer.

(5) Where fitted, disconnect the vacuum hose from the rear of the economy gauge.

(6) Remove the upper and lower screws retaining the instrument cluster panel to the instrument panel and to the instrument cluster hood.

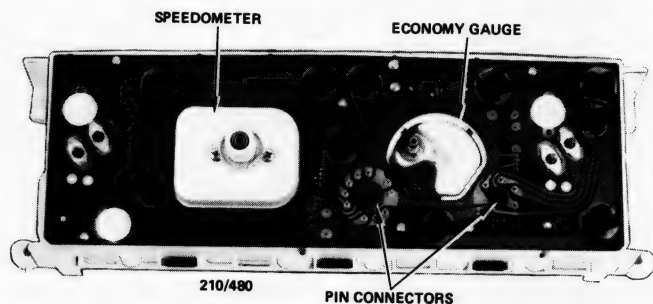
(7) Withdraw the instrument cluster panel from the instrument panel enough to gain access and disconnect the electrical connectors from the rear window demister switch, the warning lamps and where fitted, the radio antenna switch on the instrument cluster panel.

(8) Remove the instrument cluster panel from the instrument panel.

(9) Remove the screws retaining the instrument cluster to the instrument panel.

(10) Withdraw the instrument cluster from the instrument panel enough to allow access to the rear of the instrument cluster.

(11) Disconnect the two multipin plugs and the oil pressure gauge, tachometer and voltmeter connections where fitted and withdraw the instrument cluster from the instrument panel.



Rear view of instrument cluster showing location of multipin connectors, speedometer and economy gauge.

(12) If an individual gauge or instrument requires renewal, remove the clear plastic lens and the instrument cluster surround, which are a snap-on fit, from the instrument cluster. The desired gauge or instrument can be removed after removing the appropriate screws. Take in mind however that instrument gauges are interlocked and that it is necessary to remove the speedometer first, then the economy gauge, or tachometer where fitted, to be able to remove the remaining instruments or gauges.

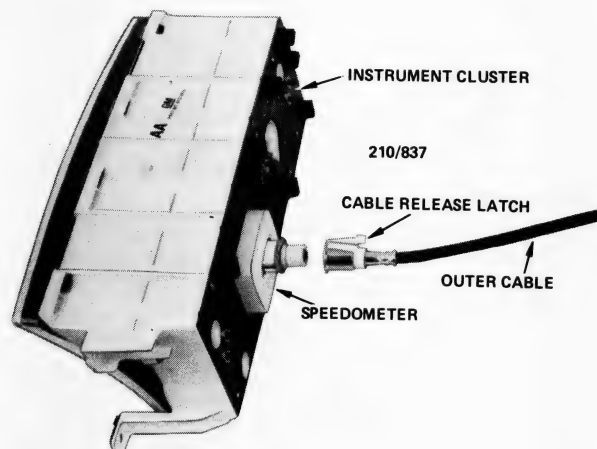
Installation is a reversal of the removal procedure with attention to the following points:

- (1) Ensure that all electrical connections are secure.
- (2) Ensure the speedometer cable is connected correctly.

14. SPEEDOMETER CABLE

TO REMOVE AND INSTAL

- (1) Disconnect the negative battery terminal.
- (2) Remove the instrument cluster as previously described.
- (3) Disconnect the speedometer cable from the transaxle.
- (4) If applicable, disconnect the vacuum hose from the inlet manifold.



Rear view of instrument cluster showing speedometer cable connection.

NOTE: On models fitted with an economy gauge, a vacuum hose runs through the same bulkhead grommet which retains the speedometer cable. It is recommended to remove this hose together with the speedometer cable and install it along side the new cable in the same position as it was on the old cable and install the cable and the hose as an assembly.

- (5) Release the cable from the engine retaining clips and prise the cable grommet from the bulkhead.
- (6) Carefully pull the cable and where applicable, the vacuum hose through the bulkhead into the engine compartment and remove from the vehicle.

Installation is a reversal of the removal procedure with attention to the following points:

- (1) Ensure that the cable is not kinked or twisted and that there are no sharp bends.
- (2) Ensure the cable is correctly engaged with the speedometer.
- (3) Where applicable ensure that the vacuum hose can be connected to the economy gauge and the inlet manifold without the hose being stretched.

15. COOLING SYSTEM FAN AND MOTOR ASSEMBLY

Special Equipment Required:

To Test Fan Motor - Ammeter

To Test Thermostatic Switch - Thermometer and ohmmeter

TO TEST FAN MOTOR ON VEHICLE

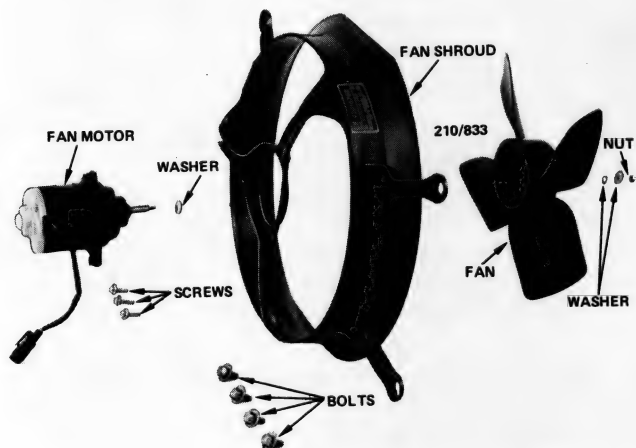
- (1) Open the engine bonnet and disconnect the negative battery terminal.
- (2) Disconnect the fan motor wiring connector from the engine compartment wiring loom.
- (3) Using suitable jumper leads connect 12 volts to the fan motor wiring connector with an ammeter in series and note the ammeter reading after one minute of starting the motor from cold.
- (4) The motor should run smoothly with the ammeter reading approximately 7 amps.
- (5) If the fan motor does not run smoothly or the current draw is excessive, the fan motor will have to be renewed.

TO REMOVE AND INSTAL FAN MOTOR

- (1) Open the engine bonnet and disconnect the negative battery terminal.
- (2) Disconnect the fan motor wiring connector from the engine compartment wiring loom and the wire connectors from the thermoswitch terminals.
- (3) Support the fan shroud and remove the bolts retaining the fan shroud to the radiator.
- (4) Remove the fan, fan motor and shroud as an assembly from the vehicle.
- (5) Remove the nut and washers retaining the fan to the motor shaft.
- (6) Remove the fan and the washer behind the fan from the motor shaft.
- (7) Remove the screws and washers retaining the fan motor to the fan shroud and remove the fan motor from the shroud.

Installation is a reversal of the removal procedure with attention to the following points:

- (1) Ensure to instal the spacer washer to the motor shaft before installing the fan.
- (2) When installing the fan shroud to the radiator ensure to position the thermostat to surge tank hose between the radiator and the upper arms of the fan shroud.



Dismantled view of cooling system fan and components.

TO REMOVE AND INSTAL THERMOSWITCH

- (1) Disconnect the negative battery terminal.
- (2) Drain the radiator as described in the Cooling System section under the heading Radiator.
- (3) Disconnect the wire connectors from the thermoswitch terminals.
- (4) Remove the thermoswitch and washer from the radiator side tank.

Installation is a reversal of the removal procedure with attention to the following points:

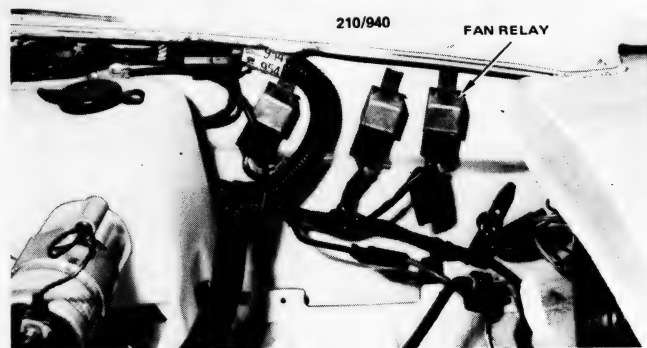
- (1) When installing the thermoswitch do not use sealing compound or tape as this will cause poor grounding.
- (2) Refill the radiator as described in the Cooling System section under the heading Radiator.

TO TEST THERMOSWITCH

- (1) Remove the thermoswitch from the radiator as previously described.
- (2) Suspend and immerse the lower half of the switch, together with a reliable thermometer in a vessel of cold water, ensuring that neither the switch nor the thermometer is touching the sides or bottom of the vessel.
- (3) The current continuity test is done with an ohmmeter or multimeter. Connect one lead or prod to the switch positive terminal and the second lead or prod to the negative terminal of the switch.
- (4) Progressively heat the water in the vessel and as the water heats, note the temperature reading on the thermometer when current flow is indicated on the ohmmeter.
- (5) Current flow should occur when the water temperature is 95 to 100 deg C.
- (6) A switch with opening temperatures not within the above range should be renewed.

TO CHECK FAN MOTOR RELAY

Prior to checking the fan motor relay, ensure that the fuse protecting the fan motor circuit is in a serviceable condition and that all the wiring connections in the cooling system fan wiring circuit are clean, dry and secure. Also test the operation of the fan motor and the thermoswitch as previously described.



Installed view of cooling system fan motor relay, battery removed.

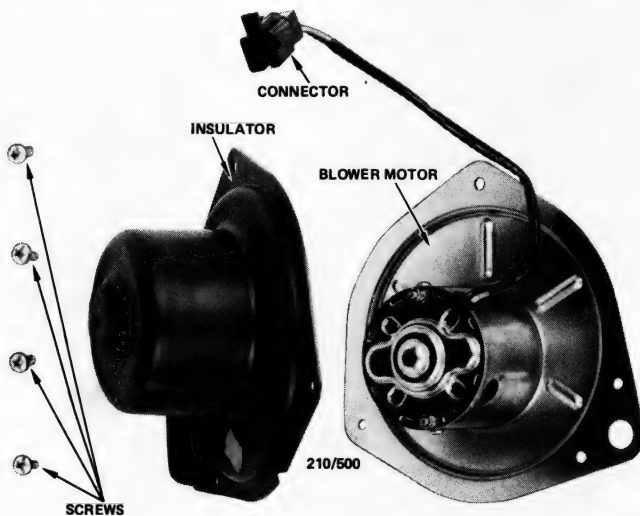
If the fan motor relay is suspected of being faulty it is recommended that the fan motor relay be replaced by a known serviceable unit.

The fan motor relay is located on the right hand side inner panel, behind the battery. See illustration.

16. HEATER BLOWER MOTOR AND FAN ASSEMBLY

TO REMOVE AND INSTAL

- (1) Disconnect the negative battery terminal.
- (2) Disconnect the blower motor wiring connector.
- (3) Fold back the clips retaining the blower motor housing insulator to the blower motor housing and remove the insulator.



View of heater blower motor.

- (4) Remove the screws retaining the blower motor and fan assembly to the blower motor housing.

- (5) Remove the blower motor and fan assembly from the blower motor housing taking care not to damage the seal installed between the blower motor mounting plate and the blower motor housing.

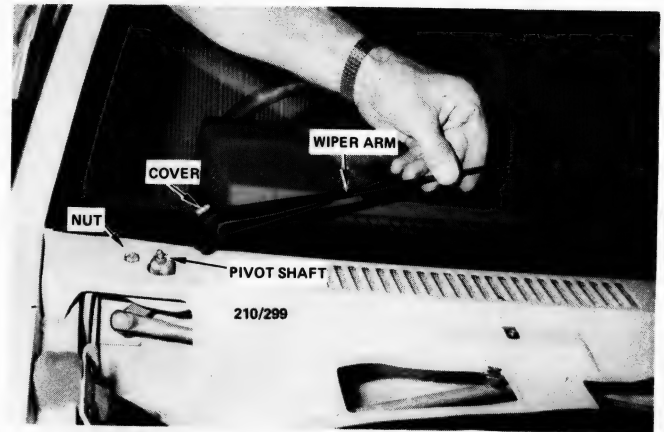
Installation is a reversal of the removal procedure, ensuring that the seal is correctly installed to the blower motor mounting plate.

17. WINDSCREEN WIPERS

WIPER ARMS

To Remove and Instal

- (1) Raise the cover on the wiper arm to gain access to the retaining nut.
- (2) Remove the nut retaining the arm to the pivot shaft.
- (3) Carefully prise the wiper arm from the pivot shaft taking care not to damage the paintwork.



Windscreen wiper arm removed from pivot shaft.

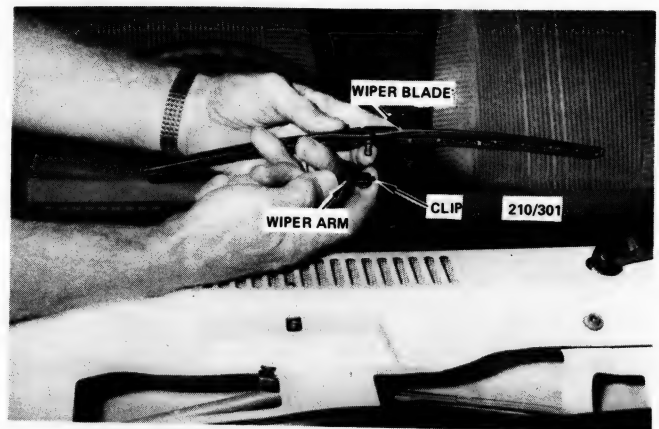
Installation is a reversal of the removal procedure with attention to the following point:

When the wipers are in the 'park' position the wiper blades should be approximately 20 mm from the windscreen weatherstrip.

WIPER BLADES

- (1) Pull the wiper arm and blade away from the windscreen until it locks in the vertical position.
- (2) Holding the wiper arm in one hand and the wiper blade in the other, lift the blade retaining clip and remove the wiper blade.

Installation is a reversal of the removal procedure.



Removing wiper blade from wiper arm.

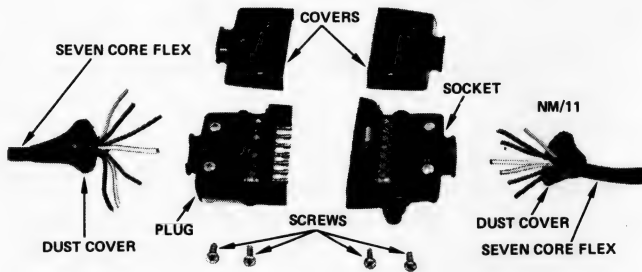
WIPER MOTOR AND LINKAGES

To Remove and Instal

- (1) Remove the wiper arms as previously described.
- (2) Raise the engine bonnet and disconnect the negative battery terminal.
- (3) Remove the screws retaining the cowl top grille to the heater air inlet chamber and to the front fenders.
- (4) Move the cowl top grille forward to dislodge the grille rear retainers.
- (5) Lift up the cowl top grille sufficiently to allow

19. HOW TO WIRE UP A TRAILER

There are many different brands of trailer electrical combination plugs and sockets on the market. Some makes can even be obtained with a varying number of circuit pin connections. Most manufacturers however, now choose to market the seven pin variety only. The seven pin plug and socket provides for two auxiliary circuits and in caravan use these are usually used for the 12 volt interior lights and the electrical brakes.



Brylite seven pin trailer plug and socket.

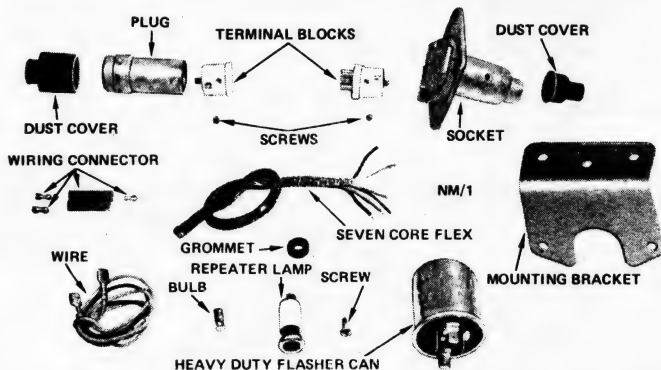
If the trailer which is to be towed by the vehicle already has a connector plug then the matching type of socket will have to be fitted to the vehicle. If on the other hand, the trailer has no plug then it is advisable to fit a seven pin type unit to the vehicle and trailer so that if at a later time auxiliary circuits are needed, it is only a matter of using the vacant pins.

FITTING THE SOCKET AND PLUG

NOTE: The minimum amount of material needed will be:

Trailer socket and plug, socket mounting bracket, multi core flex, wiring connectors, grommet, heavy duty flasher unit with repeater lamp.

- (1) Disconnect the earth lead from the battery.
- (2) Locate the main wiring harness at the rear of the vehicle and using the length of multi core flex, cut if necessary and tap into the right hand flasher wire, left



Minimum material needed for wiring up a trailer. Utilux trailer socket and plug shown.

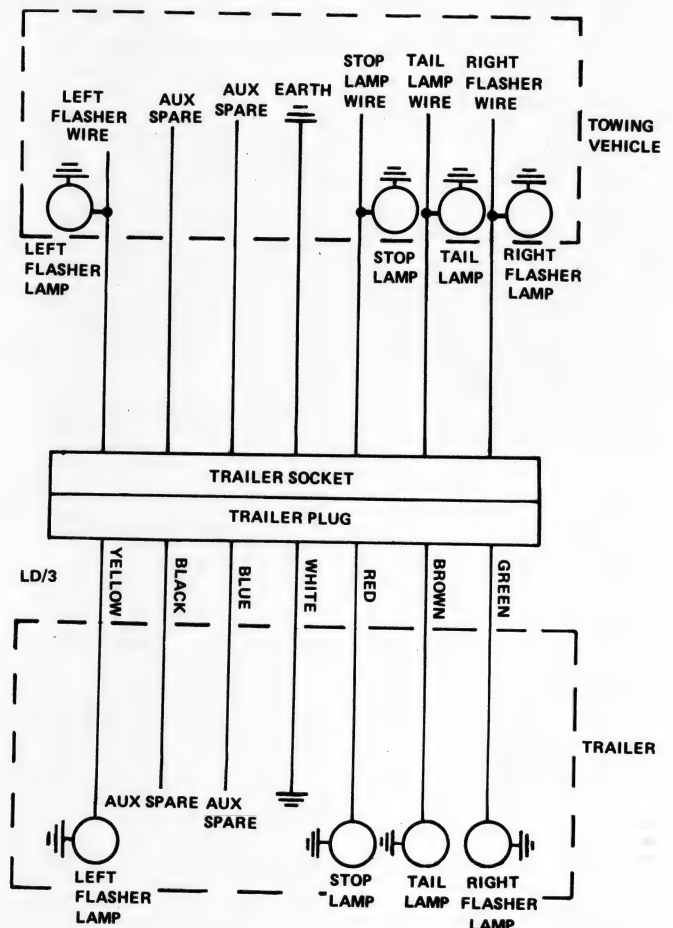
hand flasher wire, tail lamp wire, stop lamp wire and an earth wire. Use insulated connectors when tapping into the wires.

NOTE: To determine which color wire on the vehicle is for each particular rear lamp refer to the wiring diagram in this section which shows the colors for the various wires. Ensure the right diagram for the applicable model is used. When tapping into the rear wires on the vehicle conform to the standard caravan color coding by mating the correct color wire of the multi core flex to its applicable lamp or earth wire on the vehicle.

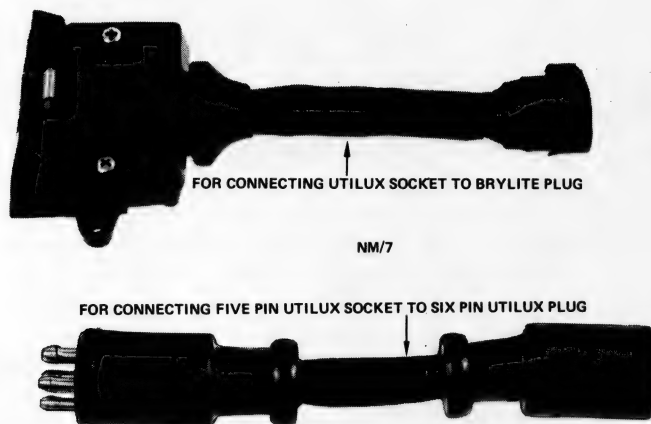
The standard caravan coding is as follows:

Left flasher Yellow
 Right flasher Green
 Stop lamp Red
 Tail lamp Brown
 Earth White
 Auxiliary spare Blue
 Auxiliary spare Black

This color coding has nothing to do with the wiring on the vehicle. It is only for the caravan or trailer wiring.



Typical diagram for wiring up a trailer.



Useful connections which can be used if trailer to be towed is fitted with different type plug to towing vehicle socket.

(3) Drill a suitable sized hole through the vehicle floor, fit a rubber grommet and push through the multi core flex.

NOTE: Before drilling a hole through the floor, check to see if there is an existing hole which will take the multi core flex. It may be convenient to use the number plate lamp wire hole. Whichever hole is used ensure that a rubber grommet is fitted to prevent the wires from chafing.

(4) Cut the multi core flex to the length required and slide the socket dust cover onto the flex. Strip about 15 mm of covering from each wire and connect the wires to the terminals of the socket. Ensure that each colored wire is connected to its correct terminal. On the brands of sockets where the terminals are only numbered it will be necessary to refer to the instruction sheet which comes with the unit to find out the correct circuit connection for each pin number.

(5) After wiring up and reassembling the socket

mount the socket to the rear of the vehicle. Try to mount the socket as near as possible to the tow bar ball and high enough to prevent damage to the socket if the rear of the vehicle happens to scrape on driveways, etc. On brands of socket that do not have an inbuilt mounting bracket it will be necessary to make up a mounting bracket or use the optional mounting bracket for that particular socket.

(6) Using the same wiring up procedure, wire the plug to the trailer wiring. If the wiring on the trailer is not to the standard color code and is an unknown quantity then it will be necessary to check out and connect up the wiring as follows:

(a) Locate the earth wire for the trailer even if all wires have to be traced on the trailer. Connect the earth wire only to the wiring plug and connect the plug to the connector on the vehicle.

(b) Connect up the vehicle's battery and switch on the tail lamps. Connect each trailer wire in turn to the live tail lamp terminal on the plug until the trailer tail lamp illuminates. When the trailer tail lamp wire is found connect this to the tail lamp terminal on the plug. Switch off the tail lamps and using the same procedure turn the other lamps on in turn and find the applicable trailer lamp by connecting to the live terminal on the plug.

NOTE: On some makes of plug it will be necessary to dismantle the terminal blocks from the plug and/or socket in order to expose the terminals.

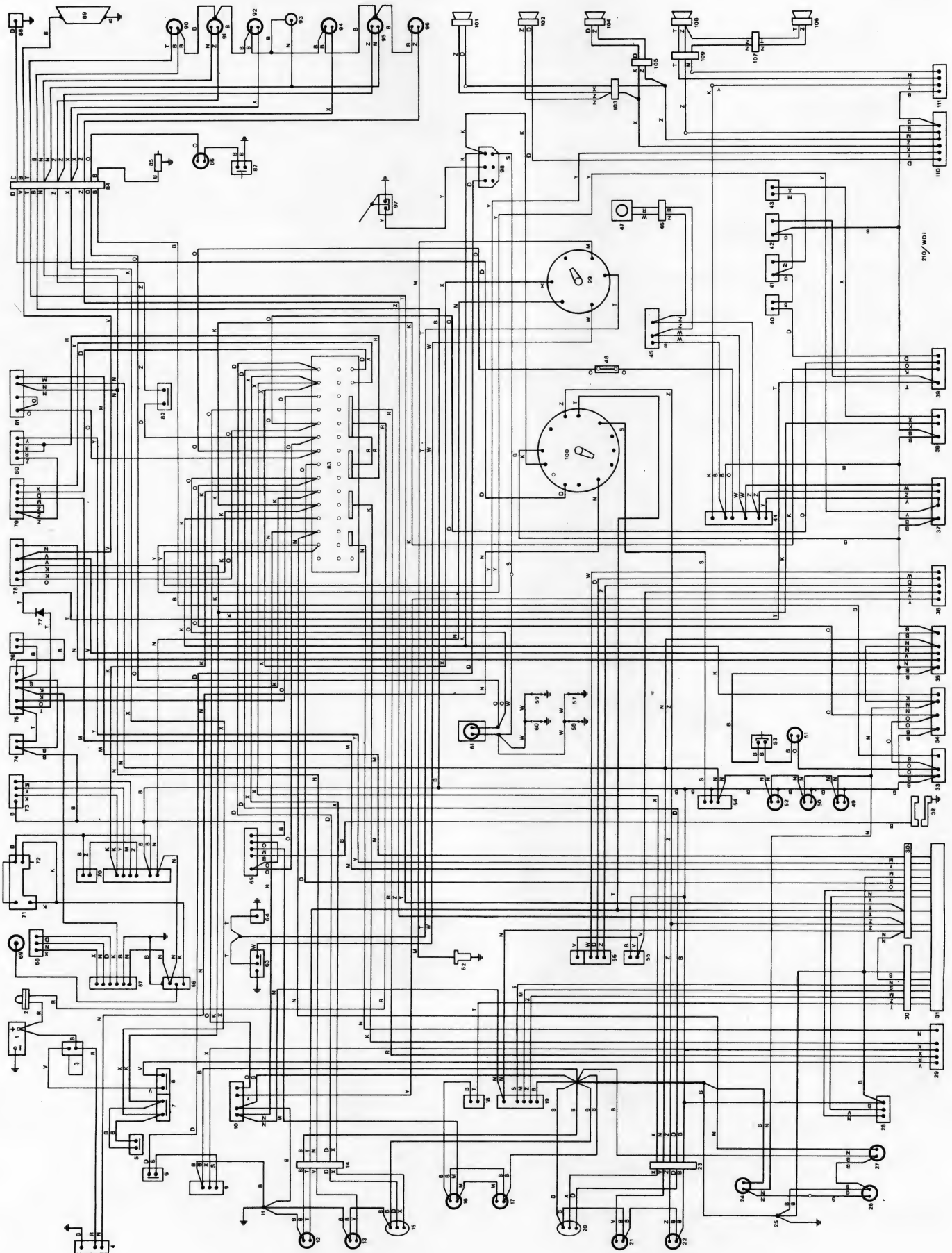
(7) Instal the heavy duty flasher unit and repeater lamp to the vehicle following the wiring up instructions which are enclosed in the flasher unit and repeater lamp kit. Ensure the correct kit is purchased for the applicable model of vehicle.

The heavy duty flasher unit keeps the flash rate constant regardless of additional load. The repeater lamp, which should be mounted in some easy to see position on the dash panel, indicates if the trailer turn signal lamps are operating.

WIRING DIAGRAM

Wiring diagram with options for all models.

COLOR CODE		KEY	30.	55.	85.
The first letter of the code represents the main wire color, the other letters represent the trace colors.			Combination switch connectors.	Heater blower motor.	Rear compartment lock solenoid.
B - Black	1.	Battery.	31. Combination switch.	56. Heater resistor.	86. Rear compartment lamp.
L - Blue	2.	Fusible link.	32. Hornbar.	57. L.H. rear door courtesy lamp switch.	87. Rear compartment lamp switch.
G - Green	3.	Starter motor.	33. Rear compartment lock switch.	58. L.H. front door courtesy lamp switch.	
R - Red	4.	Alternator.	34. Clock.	59. R.H. rear door courtesy lamp switch.	88. Fuel tank sender unit.
Y - Yellow	5.	Reverse lamp switch (Manual transmission).	35. Rear screen demister switch.	60. R.H. front door courtesy lamp switch.	89. Rear screen demister.
W - White	6.	Brake proportioning	36. Heater fan switch.	61. Courtesy lamp.	90. R.H. rear turn signal lamp.
W - White	7.	Reverse lamp switch (Automatic transmission).	37. Power aerial (SL/E).	62. Water temperature sensor.	91. Stop and tail lamp.
N - Brown	8.	Neutral safety switch	38. Air conditioner switch (optional).	63. Oil pressure sender unit (SL/E).	92. Reverse lamp.
O - Orange	9.	(Automatic transmission).	39. Auxiliary fan switch (optional).	64. Oil pressure switch	93. Number plate lamp.
K - Pink	10.	Brake warning lamp.	40. Auxiliary fan (optional).	65. Horn relay.	94. Reverse lamp.
S - Grey	11.	Heater fan relay.	41. Magnetic clutch (optional).	66. Coil.	95. Stop and tail lamp.
V - Violet	12.	Earth.R.H. wheel arch.	42. Thermostatic switch (optional).	67. Coil module.	96. L.H. rear turn signal lamp.
P - Purple	13.	R.H. turn signal lamp.	43. Evaporator motor.	68. Distributor.	97. Handbrake warning lamp switch.
X - Light Green	14.	Park lamp.	44. Power aerial module (SL/E).	69. Distributor cap.	98. Warning lamps instrument panel connector.
X - Light Blue	15.	Connector.	45. Power aerial relay (SL/E).	70. Electronic control module.	99. Instrument panel connector.
Z - Dark Green	16.	R.H. headlamp.	46. Power aerial connector.	71. Electronic choke.	100. Instrument panel connector.
M - Dark Blue	17.	Horn-high.	47. Power aerial (SL/E).	72. Anti dieseling solenoid.	101. R.H. front speaker (optional).
T - Dark Blue	18.	Horn-low.	48. Inline fuse.	73. Vacuum control module.	102. L.H. front speaker (optional).
A - Light Brown	19.	Windscreen washer pump.	49. Radio illumination lamp.	74. Thermo switch.	103. Connector.
D - Tan	20.	Windscreen wiper motor.	50. Gear shift quadrant lamp (Automatic models).	75. Cooling fan relay.	104. Front speaker.
	21.	L.H. headlamp.	51. Glove compartment lamp.	76. Cooling fan.	105. Connector.
	22.	Park lamp.	52. Heater switch illumination lamp.	77. Diode.	106. L.H. rear speaker (optional).
	23.	L.H. turn signal lamp.	53. Glove compartment switch.	78. Rear screen demister relay.	107. Connector.
	24.	Connector.	54. Rheostat.	79. Headlamp dimmer switch relay.	108. R.H. speaker (optional).
	25.	Ash tray illumination lamp.		80. Headlamp relay.	109. Connector.
	26.	Earth.L.H. wheel arch.		81. Illumination lamp relay.	110. Tape cassette (optional).
	27.	Cigarette lighter		82. Stop lamp switch.	
	28.	Cigarette lighter.		83. Fuse box.	
	29.	Flasher relay.		84. Rear loom connector.	
		Ignition switch.			



Wiring diagram with options for all models.

1. WINDSCREEN AND REAR WINDOW GLASS

The renewal or replacement of the windscreen and rear window glass is a specialist operation requiring the use of special tools.

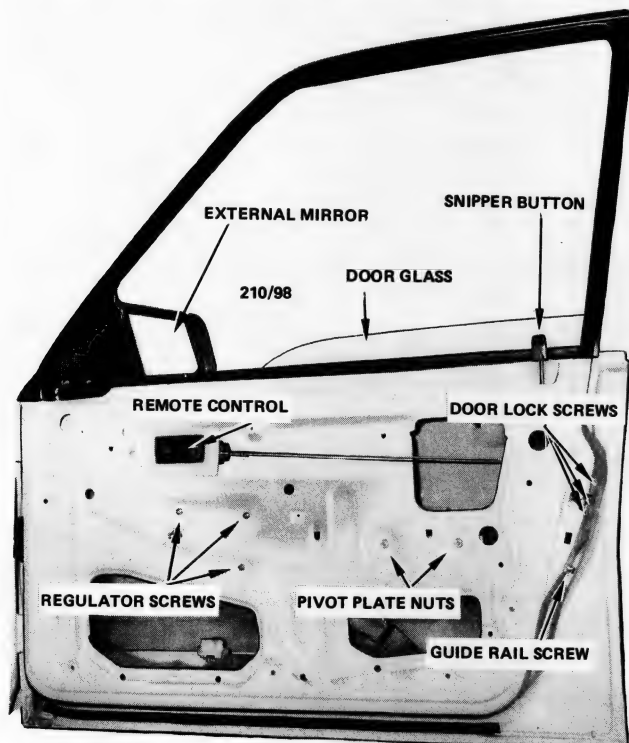
The successful fitting and sealing of the windscreen or rear window glass depends to a large extent on the technical knowledge of the operator, and it is not recommended that the windscreen or rear window glass replacement be attempted without the special tools or by anyone lacking in previous experience.

2. FRONT DOORS

INTERIOR HANDLES AND TRIM PANEL

To Remove and Instal

- (1) Wind the door glass to the closed position.
- (2) Remove the two arm rest retaining screw covers, remove the screws and detach the arm rest from the door.
- (3) Use a thin screwdriver to lever back the retaining clips and manoeuvre out the door lock remote control escutcheon.
- (4) Lever back the regulator handle escutcheon and using a suitable wire hook withdraw the handle retaining clip, then remove the handle and the escutcheon.
- (5) Using a broad bladed screwdriver carefully lever the trim outward and disengage all the retaining



Front door with trim panel removed.

clips. When all of the clips have been disengaged lift the trim panel from the door.

- (6) Carefully remove the plastic sealing sheet from the door inner panel.

Installation is a reversal of the removal procedure with attention to the following points:

- (1) Ensure that the plastic sealing sheet is correctly fitted and not torn or damaged.
- (2) Check the trim panel retaining clips and renew any damaged clips as necessary.

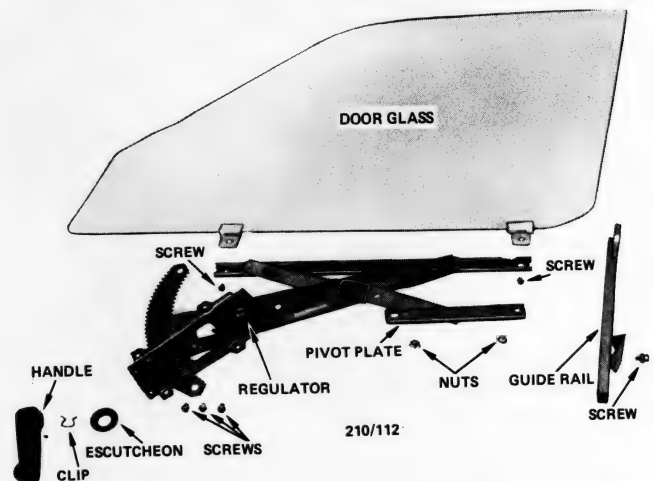
NOTE: If difficulty is incurred installing the trim panel to the door at the external mirror area, carefully prise the plastic surround from the mirror operating lever. Instal the trim panel and then clip the plastic surround back over the mirror operating lever.

- (3) With the door glass in the closed position, instal the regulator handle to correspond with the regulator handle on the opposite door.

DOOR GLASS AND REGULATOR

To Remove and Instal

- (1) Remove the interior handles, the trim panel and the plastic sealing sheet as previously described.
- (2) Remove the glass run channel from the rear guide rail. Remove the glass securing the lower end of the guide rail to the door frame. Detach the upper end of the guide rail and manoeuvre the guide rail from the door.
- (3) Lower the door glass and remove the two door glass to regulator attaching screws.
- (4) Tilt the door glass to disengage it from the run channels then lift the door glass out through the door glass opening.
- (5) Remove the two nuts and the three screws securing the regulator and pivot plate assembly to the door inner panel.
- (6) The regulator and pivot plate assembly can



Front door glass and regulator components.

now be removed from the door through the lower work aperture.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Ensure that the regulator and pivot plate sliding surfaces are adequately lubricated with a zinc oxide grease.

(2) Loosely instal the regulator and pivot plate assembly to the door inner panel.

(3) Instal the door glass into the door through the door glass opening, engage the door glass in the run channels and instal the rear run channel guide rail.

(4) Loosely instal the two door glass to regulator attaching screws.

(5) Tighten the three regulator retaining screws and operate the door glass a few times up and down to centralize the door glass. Tighten the two pivot plate nuts and the two door glass to regulator attaching screws.

(6) Instal the plastic sealing sheet, the trim panel and the interior handles as previously described.

REMOTE CONTROL AND DOOR LOCK

To Remove and Instal

(1) Remove the interior handles, the trim panel and the plastic sealing sheet as previously described.

(2) Carefully tap the interior door handle remote control assembly forward, disconnect the operating link from the door lock and remove the assembly from the door.

(3) Remove the glass run channel from the rear guide rail. Remove the screw securing the lower end of the guide rail to the door frame. Detach the upper end of the guide rail and manoeuvre the guide rail from the door.

(4) Disconnect the operating links from the exterior door handle and the door lock cylinder.

(5) Remove the three screws retaining the door lock to the door frame.

(6) Manoeuvre the door lock assembly from the door.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Lubricate the moving parts of the lock with zinc oxide grease.

(2) Ensure that the sniper rod is inserted through its aperture on the door inner panel prior to installing the door lock screws.

(3) Check that the operating links are securely installed in their correct positions.

(4) Check the operation of the exterior door handle and if necessary adjust the operating link pivot to give a small amount of free play at the exterior door handle.

(5) Instal the rear guide rail and fit the glass run channel.

(6) Check the operation of the door lock prior to installing the plastic sealing sheet, the trim panel and the interior door handles as previously described.

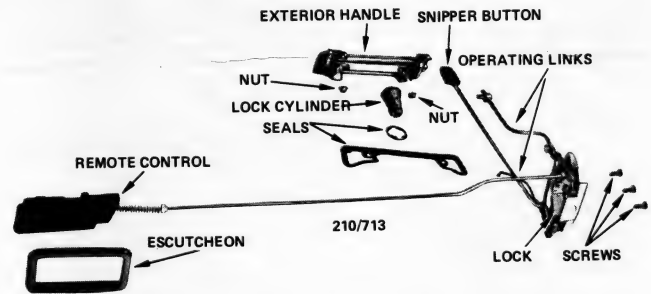
EXTERIOR DOOR HANDLE

To Remove and Instal

(1) Remove the interior handles, the trim panel and the plastic sealing sheet as previously described.

(2) Disconnect the operating link from the exterior door handle, without disturbing the position of the exterior handle operating link pivot.

(3) Remove the two nuts retaining the exterior door handle to the door and withdraw the exterior door handle.



Front door lock and remote control components.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Ensure that the exterior door handle seal is in a serviceable condition and correctly installed to prevent the entry of dust and water.

(2) Ensure that the exterior door handle operating link pivot is returned to its original position and that there is a small amount of free play at the exterior door handle.

(3) Check the operation of the door lock prior to installing the plastic sealing sheet, the trim panel and the interior handles as previously described.

LOCK CYLINDER

To Remove and Instal

(1) Remove the interior handles, the trim panel and the plastic sealing sheet as previously described.

(2) Disconnect the operating link between the door lock and the lock cylinder.

(3) Depress both sides of the lock cylinder retaining clip and withdraw the lock cylinder from the door outer panel.

Installation is a reversal of the removal procedure.

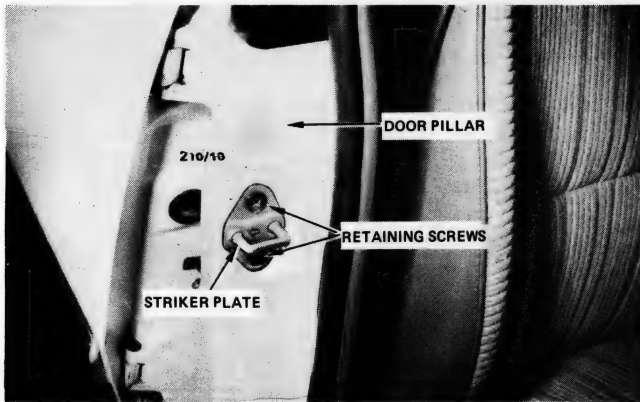
LOCK STRIKER PLATE

To Remove, Instal and Adjust

(1) Mark the position of the striker plate on the door pillar with a soft lead pencil to facilitate correct replacement of the striker plate.

(2) Remove the two screws retaining the striker plate to the door pillar and remove the striker plate. Inspect the striker plate for wear and renew as necessary.

(3) Instal the striker plate to the door pillar according to the pencil marks made on removal.



Installed view of front door striker plate.

NOTE: The assembly arrow stamped into the striker plate must face towards the outside of the vehicle.

(4) Close the door and observe the alignment with the body panel and rear door. If necessary loosen the striker plate screws and move the striker plate in or out to achieve a flush fit.

(5) If the door lifts or drops when the lock engages the striker plate, loosen the screws and move the striker plate up or down to eliminate the lift or drop.

NOTE: After each adjustment tighten the striker plate screws and check the adjustment. Readjust as necessary.

EXTERNAL MIRROR

To Remove and Instal

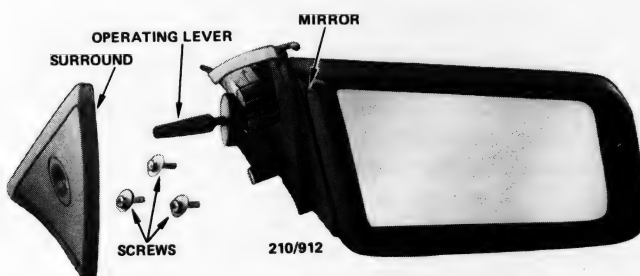
(1) From the inside of the door, carefully prise the plastic surround from the mirror operating lever.

(2) Remove the interior handles, the trim panel and the plastic sealing sheet as previously described.

(3) Remove the three screws securing the mirror to the door frame.

(4) Slide the mirror upwards, to detach the mirror housing from the door frame clips, and remove the mirror from the door.

Installation is a reversal of the removal procedure, ensuring that the rubber seals are in a serviceable condition and correctly installed to prevent the entry of dust and water.



Dismantled view of external mirror assembly.

3. REAR DOORS

INTERIOR HANDLES AND TRIM PANEL

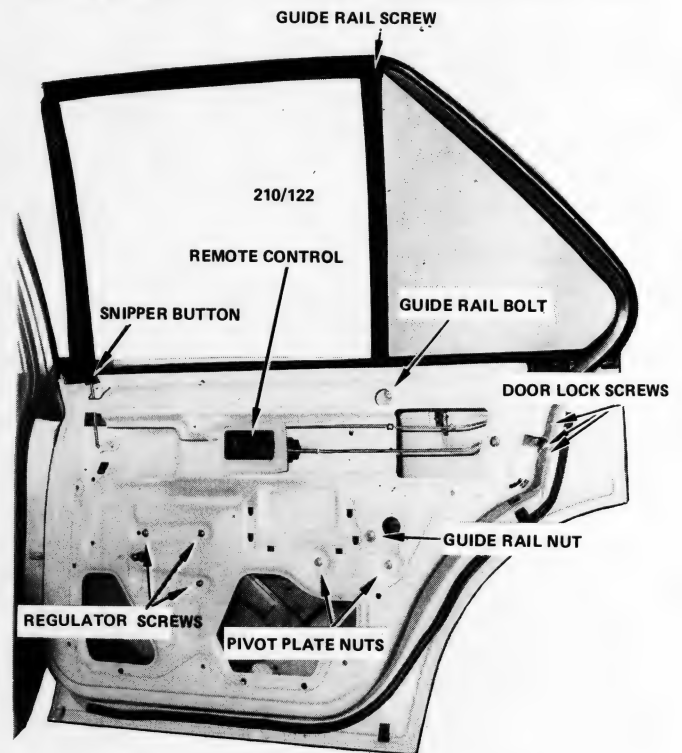
To Remove and Instal

(1) Wind the door glass to the closed position.

(2) Remove the two arm rest retaining screw covers, remove the screws and detach the arm rest from the door.

(3) Use a thin screwdriver to lever back the retaining clips and manoeuvre out the door lock remote control escutcheon.

(4) Lever back the regulator handle escutcheon and using a suitable wire hook withdraw the handle retaining clip, then remove the handle and the escutcheon.



Rear door with trim panel removed.

(5) Using a broad bladed screwdriver carefully lever the trim outward and disengage all the retaining clips. When all of the clips have been disengaged lift the trim panel from the door.

(6) Carefully remove the plastic sealing sheet from the door inner panel.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Ensure that the plastic sealing sheet is correctly fitted and not torn or damaged.

(2) Check the trim panel retaining clips and renew any damaged clips as necessary.

(3) Wind the door glass to the closed position and instal the regulator handle to correspond with the regulator handle on the opposite door.

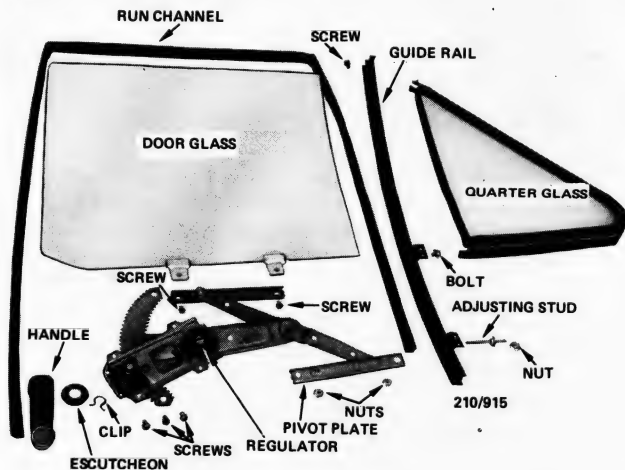
WINDOW REGULATOR, DOOR GLASS AND QUARTER GLASS

To Remove and Instal

- (1) Remove the interior handles, the trim panel and the plastic sealing sheet as previously described, with the door glass in the open position.
- (2) Remove the two regulator to door glass retaining screws.
- (3) Remove the two nuts and the three screws securing the regulator and pivot plate assembly to the door inner panel.
- (4) Hold the door glass in the up position and remove the regulator assembly from the door through the lower work aperture.
- (5) Lower the door glass and remove the screw securing the rear guide rail to the top of the door frame.
- (6) Remove the bolt attaching the guide rail to the door inner panel and remove the nut securing the adjusting stud to the inner panel. Note the position of the adjusting stud to aid assembly and unscrew the adjusting stud from the guide rail.
- (7) Disconnect the run channel from the rear guide rail and lift the guide rail out through the door glass opening.
- (8) Tilt the door glass to disengage it from the front run channel then lift the door glass out through the door glass opening.
- (9) Tilt the top of the quarter glass assembly forward and remove it from the door.

Installation is a reversal of the removal procedure with attention to the following points:

- (1) Ensure that the regulator sliding surfaces are adequately lubricated with a zinc oxide grease.
- (2) Ensure that the door glass slides freely in the run channels, if necessary adjust the rear run channel by moving the adjusting stud in the required direction.
- (3) Loosely instal the regulator and pivot plate assembly to the door inner panel and the door glass to regulator attaching screws.



Rear door glass and regulator components.

- (4) Operate the door glass a few times up and down to centralize the door glass. Tighten the two pivot plate nuts, the three regulator retaining screws and the two regulator to door glass retaining screws.

- (5) Instal the plastic sealing sheet, the trim panel and the interior door handles as previously described.

REMOTE CONTROL AND DOOR LOCK

To Remove and Instal

- (1) Remove the interior handles, the trim panel and the plastic sealing sheet as previously described.
- (2) Carefully tap the interior door handle remote control assembly forward, disconnect the operating link from the door lock and remove the assembly from the door.
- (3) Disconnect the operating links from the exterior door handle and the sniper button. If the complete sniper rod assembly is to be removed, release the operating link from its retaining clip and turn the sniper rod lever until it can be removed from the pivot.
- (4) Remove the three screws retaining the door lock to the door frame.
- (5) Manoeuvre the door lock assembly from the door.

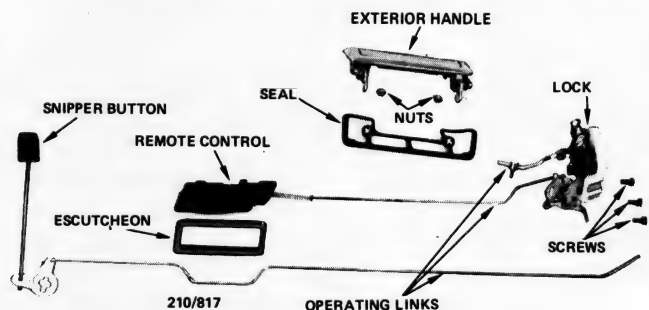
Installation is a reversal of the removal procedure with attention to the following points:

- (1) Lubricate the moving parts of the lock with a zinc oxide grease.
- (2) Instal the operating links securely in their correct positions.
- (3) Check the operation of the exterior door handle and if necessary adjust the operating link pivot to give a small amount of free play at the exterior door handle.
- (4) Check the operation of the door lock prior to installing the plastic sealing sheet, the trim panel and the interior door handles as previously described.

EXTERIOR DOOR HANDLE

To Remove and Instal

- (1) Remove the interior handles, the trim panel and the plastic sealing sheet as previously described.
- (2) Disconnect the operating link from the ex-



Rear door lock and remote control components.

terior door handle, without disturbing the position of the exterior handle operating link pivot.

(3) Remove the two nuts retaining the exterior door handle to the door and withdraw the exterior door handle.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Ensure that the exterior door handle seal is in a serviceable condition and correctly installed to prevent the entry of dust and water.

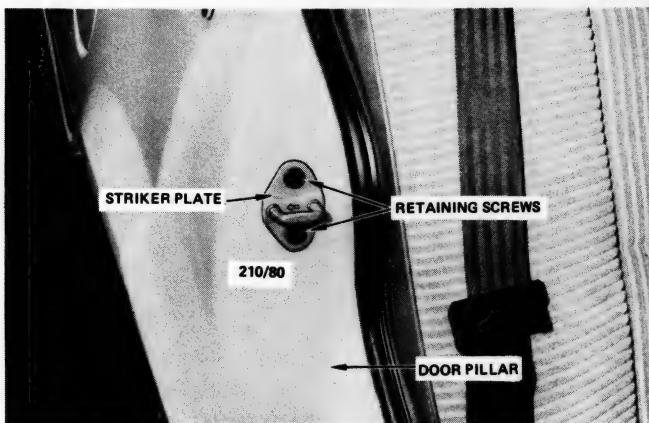
(2) Ensure that the exterior door handle operating link pivot is returned to its original position and that there is a small amount of free play at the exterior door handle.

(3) Check the operation of the door lock prior to installing the plastic sealing sheet, the trim panel and the interior handles as previously described.

LOCK STRIKER PLATE

To Remove, Instal and Adjust

(1) Mark the position of the striker plate on the door pillar with a soft lead pencil to facilitate correct replacement of the striker plate.



Installed view of rear door lock striker plate.

(2) Remove the two screws retaining the striker plate to the door pillar and remove the striker plate. Inspect the striker plate for wear and renew as necessary.

(3) Instal the striker plate to the door pillar according to the pencil marks made on removal.

NOTE: The assembly arrow stamped into the striker plate must face towards the outside of the vehicle.

(4) Close the door and observe the alignment with the body panel. If necessary loosen the striker plate retaining screws and move the striker plate in or out to achieve a flush fit.

(5) If the door lifts or drops when the lock engages the striker plate, loosen the screws and move the striker plate up or down to eliminate the lift or drop.

4. ENGINE BONNET

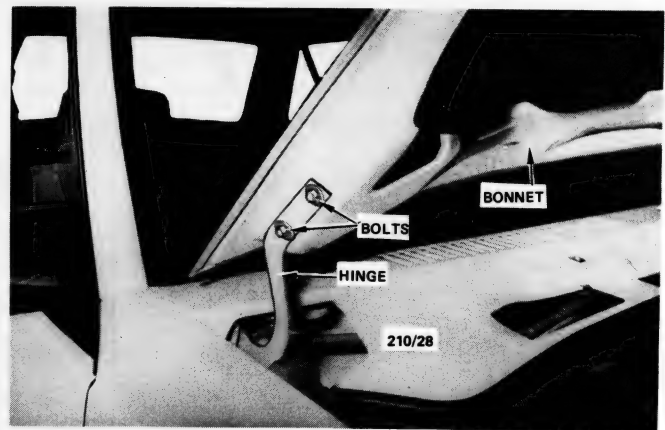
TO REMOVE

(1) Raise the engine bonnet and fit fender covers to both front fenders.

(2) Using a soft lead pencil, mark the bonnet around the bonnet hinges to facilitate accurate refitting.

(3) With the aid of a second operator support the bonnet and disconnect the bonnet stay. Remove the four bolts retaining the bonnet to the bonnet hinges and remove the bonnet from the vehicle.

Installation is a reversal of the removal procedure ensuring that the pencil marks made on removal are aligned.



View of bonnet hinge.

TO INSTAL AND ADJUST

(1) With the aid of a second operator, place the bonnet in position on the vehicle and support it at the front on the bonnet stay.

(2) Instal the two bolts and washers securing each hinge plate to the bonnet, position the hinge plates according to the marks made on removal and tighten the bolts securely.

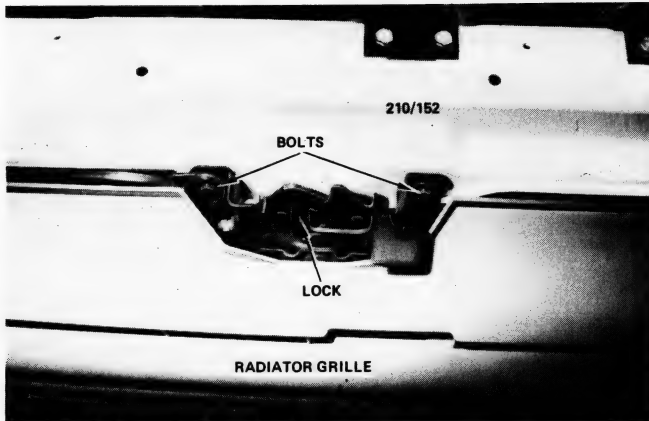
(3) Close the bonnet on the safety catch and check its alignment in relation to each front fender along the sides and the rear edge of the bonnet to the body.

NOTE: Do not fully close the bonnet otherwise an error could result due to incorrect positioning of the bonnet catch.

(4) If adjustment is required, open the bonnet and loosen the bolts securing the hinge plates to the bonnet just sufficiently to enable the bonnet to be moved slightly sideways or fore and aft.

(5) Close the bonnet past the safety catch, but do not completely close it on the final lock.

(6) Move the bonnet sideways or fore and aft until the space between the bonnet and each front fender is uniform, and the space between the rear edge of the



Installed view of bonnet lock assembly.

bonnet and the corresponding edge of the body is also uniform.

(7) Carefully raise the bonnet and tighten the bolts securing the hinge plates to the bonnet.

(8) Lower the two bonnet bump rubbers fully so that they do not touch the front panel when the bonnet is fully closed.

(9) Loosen the two bonnet catch to body retaining bolts and centralize the bonnet catch with the striker on the bonnet. Tighten the bonnet catch retaining bolts temporarily.

(10) Raise the height of the two bonnet bump rubbers until the bonnet is flush with the front fenders.

(11) Loosen the bonnet catch retaining bolts and adjust the height of the catch to remove all the free play so that the bonnet can be opened with ease. Ensure that the safety catch lever engages with the striker after the bonnet catch has been released.

5. LUGGAGE COMPARTMENT LOCK AND LID

TO REMOVE AND INSTAL LID

(1) Open the luggage compartment lid and mark the lid around the hinges with a soft lead pencil to facilitate accurate refitting.

(2) With the aid of a second operator support the luggage compartment lid, remove the four bolts retaining the lid to the hinges and remove the luggage compartment lid from the vehicle.

Installation is a reversal of the removal procedure, ensuring that the pencil marks made on removal are aligned.

TO ADJUST LID

(1) Loosen the hinge to luggage compartment lid retaining bolts and retighten them finger tight.

(2) Close the luggage compartment lid and by pushing with the hand, position the lid evenly in its opening.

(3) Open the lid carefully and tighten the retaining bolts.

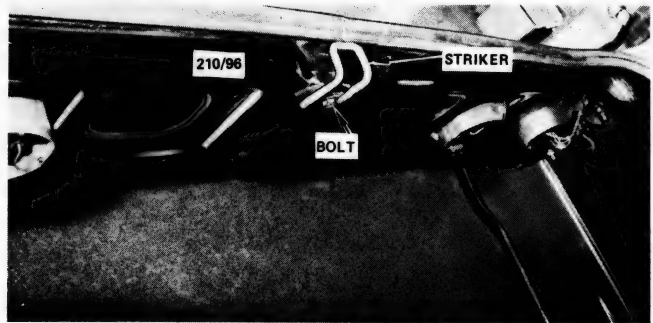
(4) Recheck for correct positioning, if necessary loosen one bolt at a time to adjust.

TO ADJUST LOCK STRIKER PLATE

(1) Loosen the striker plate retaining bolt and retighten finger tight.

(2) Close the luggage compartment lid and push it firmly shut.

(3) Carefully open the luggage compartment lid without moving the striker plate.



View of luggage compartment lock striker plate.

(4) Tighten the striker plate retaining bolt, close the luggage compartment lid and check the ease of operation of the lock. Ensure that no free play exists between the luggage compartment lid and the weatherseal, which would allow the entry of water or dust. Readjust the striker plate if necessary.

TO REMOVE AND INSTAL LOCK AND LOCK CYLINDER

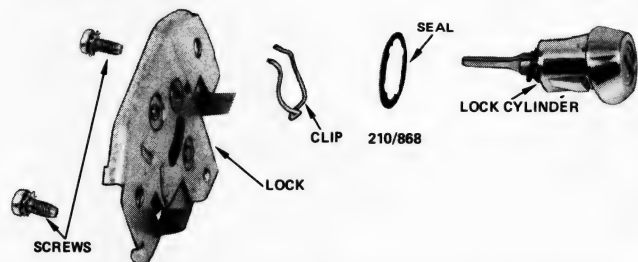
(1) Open the luggage compartment lid.

(2) Remove the two screws retaining the lock to the luggage compartment lid and remove the lock.

(3) Using a suitable screwdriver, remove the lock cylinder retaining clip and withdraw the lock cylinder from the luggage compartment lid.

Installation is a reversal of the removal procedure with attention to the following point:

Check the operation of the lock and adjust the position of the striker plate if necessary as previously described.

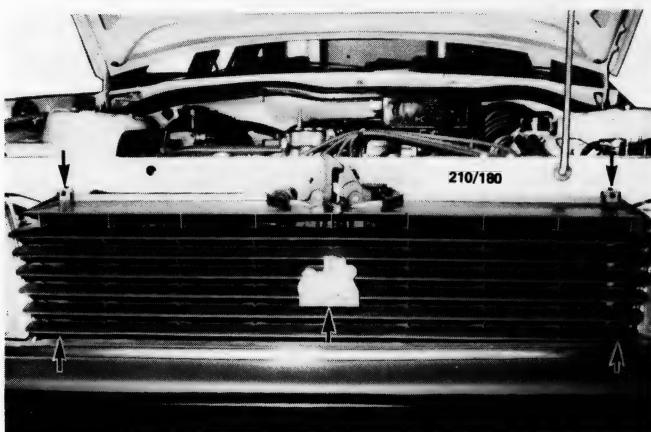


Dismantled view of luggage compartment lid lock and lock cylinder components.

6. RADIATOR GRILLE

TO REMOVE AND INSTAL

- (1) Raise the engine bonnet.
- (2) Using a suitable thin bladed screwdriver, prise the raised section of the two upper grille retaining clips up into their release slots and pull the grille forward slightly to fully release the clips.
- (3) The centre retaining clip behind the grille emblem is released by prising the head of the retaining clip towards the drivers side of the vehicle.
- (4) The raised section of the lower retaining clips must also be prised up to release them from the grille. It may be necessary to insert a second screwdriver between the grille and the front bumper to carefully lever the grille up slightly to gain access to the heads of the retaining clips.
- (5) After the five clips have been released pull the grille forward to fully disengage the clips and manoeuvre the grille from the vehicle.



View of radiator grille showing location of retaining clips.

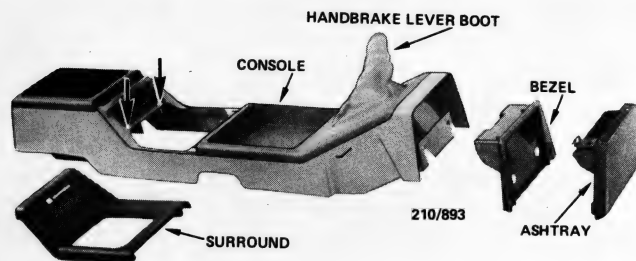
Installation is a reversal of the removal procedure with attention to the following points:

- (1) Remove the grille retaining clips from the front body panel by turning them through 90 degrees to release the clips from the slotted holes.
- (2) Fit the clips to the grille ensuring the raised section of each clip is securely locked in place.
- (3) Instal the grille in position and align each clip with its mounting hole.
- (4) Push the grille firmly into position ensuring that each clip is fully inserted into its mounting position.

7. CENTRE CONSOLE

TO REMOVE AND INSTAL

- (1) Disconnect the negative battery terminal and apply the handbrake.
- (2) Open the ashtray at the rear of the console, depress the retaining clip and remove the ashtray.



View of centre console and associated components, manual transmission model shown. Arrows indicate mounting points.

- (3) Remove the two console retaining screws from the ashtray recess and remove the ashtray bezel.
- (4) Using a twisting motion, withdraw the handbrake lever grip from the handbrake lever.
- (5) Lift the front of the gear selector lever surround up and detach the surround from the console.
- (6) Remove the console retaining screws from the front of the gearshift recess.
- (7) Select Park on automatic transmission models or first gear on manual transmission models. Slide the console forward to release the handbrake lever boot from the handbrake lever and manoeuvre the console from the vehicle.

Installation is a reversal of the removal procedure. Apply a minimal amount of a suitable glue to the inside of the handbrake lever grip to retain the grip on the handbrake lever.

8. VEHICLE CLEANING

CLEANING THE EXTERIOR

In order to remove dirt and road grime and thus preserve paint finish, vehicles in continuous use should be washed at least once a week.

Before washing the paintwork it is good policy to first hose all dirt from the underbody and clean out the drain holes in the doors and sill panels.

Hose the vehicle first to remove as much grit as possible then wash using a clean chamois or sponge, ensuring that the chamois or sponge is free from dirt or grit which could scratch the paint surface.

Avoid washing the vehicle in the bright sunlight with high temperatures as this will give the paintwork a streaky watermarked finish.

If necessary wash the vehicle using a reputable brand 'Wash and Wax' liquid. The 'Wash and Wax' liquid will restore the paint lustre and leave the paintwork with a protective coating of wax.

After a period it may become necessary to polish the vehicle in order to remove build up of foreign matter and to give the paintwork maximum protection from industrial fall-out, and salt from sea air etc. Before polishing the paintwork always wash the surface to remove as much road grime as possible. When polishing follow the polishing instructions which come with the polish.

NOTE: Grease, oil or tar on the paint surface can be removed with a little kerosene or white spirits. To prevent from staining, wash and polish the affected area as soon as the grease, oil or tar is removed.

GENERAL CLEANING OF VINYL UPHOLSTERY AND TRIM

To maintain the vinyl upholstery and interior trim in good condition it should be regularly vacuumed over to remove loose dirt and then wiped over with a dry or damp cloth.

If the upholstery is soiled or stained the following cleaning procedure is recommended:

- (1) Using warm water, cheese cloth and a mild soap thoroughly wash the affected areas.
- (2) Repeat the operation using damp cheese cloth only.
- (3) To complete the cleaning operation wipe the upholstery over with a dry piece of cheese cloth.

NOTE: If the upholstery or interior trim is badly soiled or stained, wash with a reputable brand of upholstery cleaner carefully following the maker's instructions.

TO REMOVE STUBBORN STAINS ON VINYL UPHOLSTERY AND TRIM

NOTE: The following cleaning procedures with recommended removal agents should be used before contemplating trim renewal.

Chewing Gum

- (1) Apply an ice cube to harden the gum.
- (2) Remove as much of the gum as possible with the edge of a spoon.
- (3) Wipe the remaining gum off with a cloth moistened with methylated spirits.
- (4) Finish by washing the affected area with warm soapy water and drying with a clean cloth.

Grease and Other Fatty Stains

- (1) Use a clean dry cloth and remove as much of the grease as possible taking care not to spread the grease any further.
- (2) Carefully wipe away the remaining grease using a cotton cloth moistened with methylated spirits or mineral turps.
- (3) Finish by washing the affected area with warm soapy water and drying with a clean cloth.

Chocolate

- (1) Remove as much of the chocolate as possible with the edge of a spoon.
- (2) Wipe the remaining chocolate off with a cloth moistened with methylated spirits.

- (3) Finish by washing the affected area with warm soapy water and drying with a clean cloth.

Ballpoint Pen Inks

- (1) Mix up equal parts of fresh Calcium Chloride and Fullers Earth. The Calcium Chloride and Fullers Earth can be purchased at the local chemist.
- (2) Add a few drops of methylated spirits and mix all ingredients into a thick paste.
- (3) Apply the paste to the ink stain and allow it to dry.
- (4) Remove the dried paste with a damp cloth.
- (5) Finish by wiping the affected area with a wet cloth and drying with a clean cloth.
- (6) If some of the ink stain remains, repeat the cleaning procedure.

NOTE: If the removal of the ink stain leaves the affected area dull, the affected area can be revived by wiping over with cotton wool moistened with glycerine.

Toffee

- (1) Remove as much of the toffee as possible with the edge of a spoon.
- (2) Wash as much of the remaining toffee off using a soft cloth and very hot water.
- (3) To finish the cleaning operation first wipe the affected area over with a cloth moistened with methylated spirits then wash with warm soapy water and dry with a clean cloth.

Blood

- (1) Wash the affected area immediately with cold water.
- (2) If the affected area is still stained, wipe over with household ammonia.
- (3) Finish by washing with warm soapy water and drying with a clean cloth.

Liquor and Fruit Stains

- (1) Wash the affected area with very hot water and allow it to dry.
- (2) When dry wipe over with a clean cloth moistened with methylated spirits.
- (3) Finish by washing the affected area with cold water.

Tar

- (1) Wipe with a clean cloth moistened with mineral turps or kerosene.
- (2) Finish by washing affected area with cold water.

NOTE: Quick action is most essential with tar stains. If the tar is left on the upholstery for

any length of time permanent staining will result.

Ice Cream

- (1) Wash the affected area with warm soapy water.
- (2) If the stain still remains wash repeatedly with very hot soapy water.
- (3) Finish by wiping over the affected area with a cloth moistened with methylated spirits and washing again with warm soapy water.

CLEANING CLOTH TRIM

Loose dirt and dust on cloth trim should be removed with a vacuum cleaner or a very soft brush. Do not use a whisk brush or any other type of coarse brush or damage to the cloth could result. If the fabric is soiled the following cleaning procedure is recommended:

- (1) Sponge the fabric lightly with warm water containing a little detergent and household ammonia.
- (2) After sponging rub the fabric lightly. If soiling is still apparent repeat the sponging operation.
- (3) Use a clean dry cloth to soak up excess fluid.

INTRODUCTION

To reduce the output levels of carbon monoxide (CO), hydrocarbons (HC) and oxides of nitrogen (NOX) which are the three primary automotive emissions causing air pollution, several emission control systems are used.

The systems are known as and will be discussed under the headings, (1) Crankcase Ventilation System, (2) Air Preheat System, (3) Emission Management System, (4) Pulsair Injection System, (5) Exhaust Gas Recirculation System and (6) Evaporative Control System.

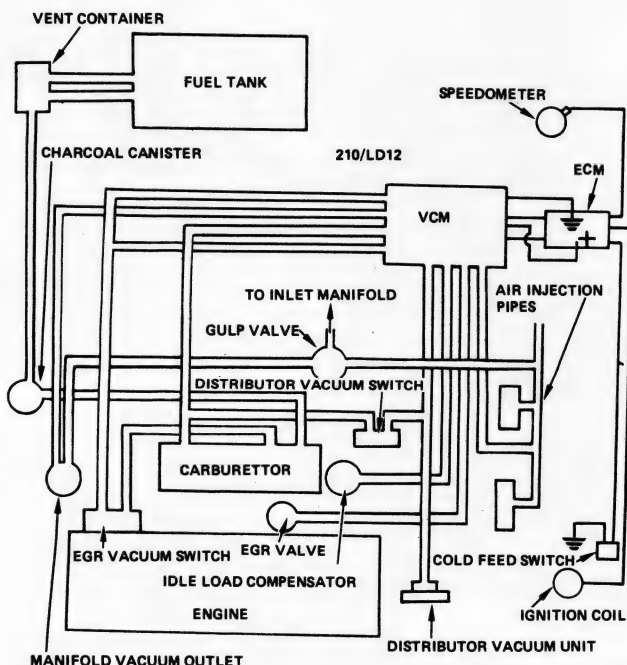
1. CRANKCASE VENTILATION SYSTEM

DESCRIPTION

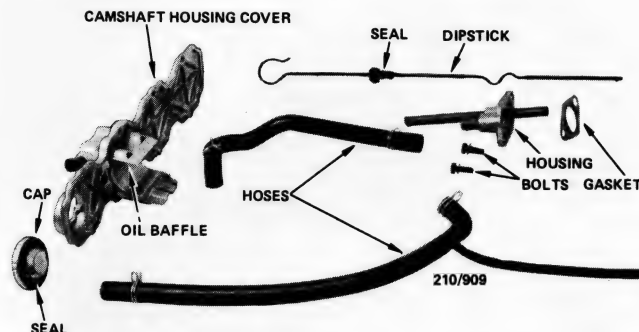
The crankcase ventilation system is of the closed type and is designed to prevent crankcase vapours being emitted into the atmosphere. Crankcase vapours are caused by some gases escaping past the piston rings into the crankcase during the combustion process.

The crankcase vapours are collected in the camshaft housing from the crankcase via the various oil drain passages and by a hose connected directly from the dipstick housing to the camshaft housing.

At normal running conditions, a hose connected to the outlet of the oil baffle which is mounted in the camshaft housing cover feeds the crankcase vapours into the air cleaner to be burnt by the engine. The oil baffle to air cleaner hose also has a smaller hose connected to it which allows crankcase vapours to be fed directly into the inlet manifold at engine idle.



Schematic layout of various emission control components.



Dismantled view of the crankcase ventilation system components.

TO SERVICE THE SYSTEM

(1) Check the condition of the camshaft housing cover to air cleaner assembly hose and the dipstick housing to camshaft housing hose. Carefully check for blocking, collapsing or deterioration. Renew the hoses as necessary.

(2) If necessary the oil baffle fitted to the underside of the camshaft housing cover can be removed and cleaned in a suitable solvent.

2. AIR PREHEAT SYSTEM

DESCRIPTION

Efficient combustion of the air/fuel mixture is dependent upon a constant inlet gas temperature. This is achieved primarily by a thermostatically controlled flap situated in the air cleaner intake spout and depending on the flap position, heated air or underhood air is drawn into the engine.

A stove on the exhaust manifold supplies warm air to the thermostatically controlled flap in the air cleaner intake spout. This flap is operated by a vacuum servo unit which is controlled by a heat sensitive (thermostatic) valve situated in the main body of the air cleaner.

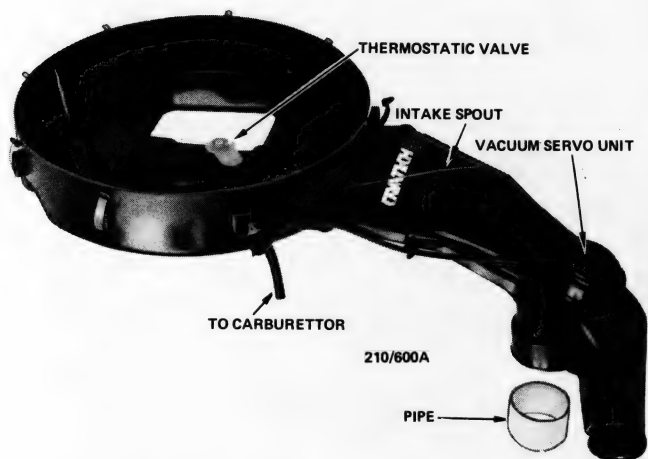
The vacuum to operate the servo unit is supplied by a hose connected to the base of the carburettor and the heat sensitive (thermostatic) valve is operated by the temperature of the air being drawn into the main body of the air cleaner.

The function of the system is as follows:

When the engine starts and the air intake temperature is below 30 deg C the bi-metal spring closes the thermostatic valve in the air cleaner to atmosphere. With the valve closed manifold vacuum is effective through the hoses to the servo arrangement on the air cleaner intake.

Vacuum then draws the servo diaphragm inwards and through a linkage closes the cold air flap. As soon as the flap closes warm air is permitted to enter the air cleaner by way of the warm air intake pipe which now has no restriction. This warm air is conducted from the stove around the exhaust manifold to the air cleaner.

As the temperature rises in the air cleaner body the



Dismantled view of air cleaner showing location of air preheat components.

bi-metal spring in the valve actuates opening the valve to atmosphere which in turn collapses the vacuum in the two hoses. Flap action takes place cutting off the hot air flow and opening the underhood air supply.

Irrespective of temperature the system is also designed to draw in underhood air at high speeds when decreasing manifold vacuum and a higher differential pressure across the flap permits the flap to open.

TO CHECK OPERATION

Before carrying out the following test, ensure that the engine is cold, the air intake temperature is below 30 deg C and the vacuum hoses are in a serviceable condition.

(1) Start the engine and set the carburettor fast idle screw on the lowest step of the fast idle cam. The engine should idle at approximately 1200 rpm.

(2) In this condition the air cleaner should only be supplied with warm air from the exhaust manifold stove.

(3) Allow the engine to idle for fifteen minutes and inspect the position of the air cleaner intake flap. The flap should now be in the open position allowing underhood air to be drawn into the air cleaner and shutting off air from the exhaust manifold heat stove.

(4) If the air intake flap does not operate as described above, check the thermostatic valve in the air cleaner body and the servo unit mounted in the air cleaner intake spout and replace as necessary. Ensure that the air intake flap is not fully or partially seized.

TO RENEW COMPONENTS

(1) To renew the bi-metal thermostatic valve in the air cleaner, remove the air cleaner assembly from the vehicle and dismantle the upper cover. The valve is secured in the air cleaner body by a retaining clip. The retaining clip is fitted to the underside of the air cleaner body and can be detached from the valve with a screwdriver. When fitting a new valve ensure that it is mounted in the same position as the original assembly. When installing the air cleaner back to the engine do not forget

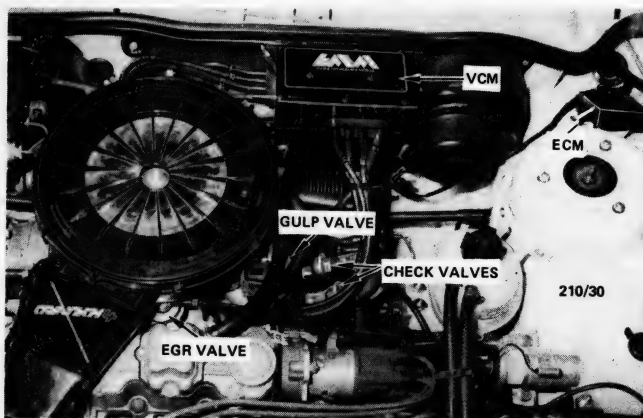
to connect up the two small hoses to the bi-metal valve connections on the underside of the air cleaner.

(2) To renew the vacuum servo unit mounted on the air cleaner intake remove the vacuum hose from the servo unit. Prise the air intake spout from the air cleaner assembly with a suitable screwdriver. Replace the air intake spout and servo unit as an assembly and connect the vacuum hose.

3. EMISSION MANAGEMENT SYSTEM

DESCRIPTION

The emission management system consists of a vacuum control module (VCM) and an electronic control module (ECM). Both units are mounted on the engine compartment bulkhead.



Installed view of the vacuum control module (VCM), the electronic control module (ECM) and various emission control components.

The ECM is controlled by electrical signals from the ignition coil, the speedometer and the engine cold feed switch (CFS) which monitors engine oil temperature.

The VCM is controlled by electrical signals from the ECM and vacuum signals from the inlet manifold and carburettor.

The vacuum and electronic control modules combine to affect the operation of the distributor vacuum advance, the idle load compensator (ILC) and the exhaust gas recirculation (EGR) valve. Two thermal vacuum switches (TVS) affect the vacuum signals under certain conditions to vary the working procedures of the above components.

4. PULSAIR INJECTION SYSTEM

Special Equipment Required:

To Test Gulp Valve - Suitable vacuum pump

DESCRIPTION

To ensure complete combustion of the unburnt mixture in the exhaust, filtered air is introduced to the exhaust system by means of the air injection system. In doing so

the emission of hydrocarbon and carbon monoxide to the atmosphere is reduced.

The system is comprised of two one way check valves, supply pipes, three injection nozzles in the exhaust ports and a gulp valve. Air injection is supplied to cylinders, one, two and four with cylinders one and four sharing a common check valve. Filtered air is supplied to the check valves via a hose connected to the air cleaner body.

Negative exhaust pressure in one injection pipe causes the associated check valve to open and allow filtered air into the relevant exhaust port.

To prevent combustion in the exhaust when the engine is in an over-run condition with the throttle closed, a gulp valve is connected between the filtered air intake of the check valves and the inlet manifold. The gulp valve allows a measured amount of filtered air to enter the combustion chambers to ensure complete combustion during this period and therefore to prevent popping in the exhaust due to the combustion of unburnt fuel.

TO REMOVE AND INSTALL CHECK VALVES

(1) Remove the clamp securing the filtered air inlet hoses to the check valves. Slide the hoses from the valves.

(2) Hold the check valve at the injection pipe mounting union using a suitable spanner. With another spanner loosen the attaching union nut.

(3) Unscrew the nut completely and remove the check valve from the injection pipe. Remove the other check valve using the same procedure.

(4) The check valve is operating correctly if air can be blown through it from the air cleaner side but not from the engine side. Replace the valves as necessary.

Installation is a reversal of the removal procedure.

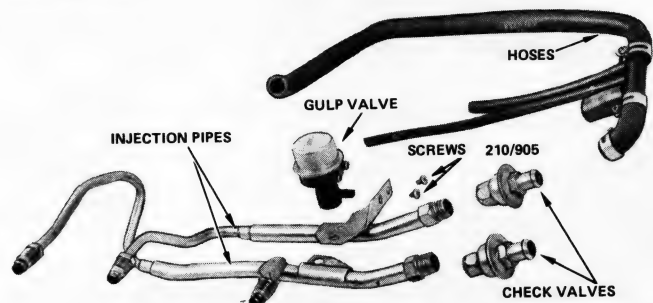
TO REMOVE AND INSTALL INJECTION PIPES

(1) Remove the air cleaner assembly. If necessary refer to the Fuel system section for the correct procedure.

(2) Remove the check valves and the gulp valve as described in this section.

(3) Remove the bolt retaining the injection pipe bracket to the underside of the inlet manifold.

(4) Working beneath the inlet manifold remove the three flange nuts securing the injection pipes to the cylinder head.



Dismantled view of the pulsair injection system components.

(5) Manoeuvre the injection pipes from beneath the inlet manifold.

Installation is a reversal of the removal procedure.

TO REMOVE AND INSTALL GULP VALVE

(1) Remove the three hoses from the gulp valve. The lower of the three hoses in the filtered air inlet hose, the centre hose is the manifold outlet hose and the upper hose (smallest of the three hoses) is the gulp valve signal hose.

(2) Remove the two screws securing the valve to the injection pipe bracket and remove the gulp valve.

(3) Blow through the filtered air inlet port of the gulp valve. The valve should not allow any air to pass to the other ports.

(4) Block the manifold outlet port of the gulp valve and apply a vacuum of 60 kPa to the gulp valve signal port. No great loss of vacuum should be noticed.

(5) With vacuum still applied to the signal port, unblock the manifold outlet port and blow through the filtered air inlet port. The valve should be open and air allowed to pass from the filtered air inlet port to the manifold outlet port.

(6) Replace the gulp valve if it does not conform to these tests.

Installation is a reversal of the removal procedure.

5. EXHAUST GAS RECIRCULATION SYSTEM

Special Equipment Required:

To Test EGR Valve – Suitable vacuum pump

DESCRIPTION

To further decrease pollution levels from the engine exhaust, a portion of the exhaust gases are recirculated through the engine combustion process. This has the effect of reducing the combustion temperatures and lowers the NOX level of the exhaust gases.

The EGR system is comprised of a spring loaded diaphragm type valve mounted to the inlet manifold and a thermal vacuum switch (TVS) located in the engine cylinder block at the rear of the starter motor.

TO REMOVE AND CLEAN EGR VALVE

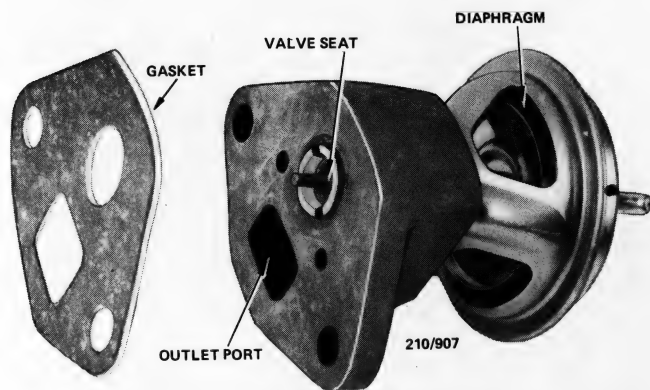
WARNING: Damage to the diaphragm may occur if the valve assembly is immersed in solvents or degreasing liquids.

(1) Disconnect the vacuum hose from the EGR valve.

(2) Remove the retaining bolts and remove the EGR valve and gasket from the inlet manifold.

(3) Hold the valve in one hand, then with a small plastic hammer, gently tap round the sides and end of the valve to loosen the carbon deposits on the valve seat.

(4) Manually depress the valve diaphragm and



View of exhaust gas recirculation valve.

visually inspect the valve seat through the outlet port. If carbon deposits are visible repeat operation (3).

(5) Remove the carbon deposits from the valve mounting surfaces.

(6) Using a suitable scraper or screwdriver, remove the carbon deposits from the outlet port of the valve and inlet ports to the manifold.

(7) Check the operation of the EGR valve with a vacuum of 33 kPa applied to the valve vacuum port. The valve should be fully open.

(8) Release the vacuum until a reading of 17 kPa is shown on the vacuum gauge. The valve should be open approximately halfway. Replace the valve if it is not operating correctly.

(9) Using a new gasket, refit the valve to the manifold and securely tighten the retaining bolts.

6. EVAPORATIVE CONTROL SYSTEM

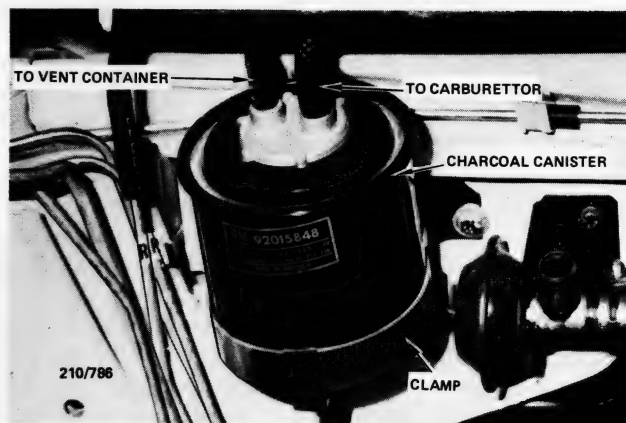
DESCRIPTION

The evaporative control system is employed to prevent evaporative gases in the fuel tank from entering the atmosphere and so assists in the reduction of hydrocarbon emissions from the vehicle.

The components of the evaporative control system are: (1) Positive sealed fuel tank (2) Vent container (3) Vapour lines (4) Charcoal canister.

NOTE: The fuel tank filler cap is not vented to the atmosphere but it is fitted with pressure and vacuum valves as a safety measure against extreme pressure build up in the fuel tank.

When the engine is at rest, evaporation of the fuel gradually fills the air space in the fuel tank with vapour.



Installed view of charcoal canister.

Vapour is cleared from the vent lines to the vent container which also prevents vapour surge. The vent container is located at the fuel tank filler neck. From the vent container the vapour is routed to the charcoal canister. The charcoal canister is located in the engine compartment, beneath the steering gear. The charcoal in the canister absorbs the petrol vapour. When the engine is running the vapour is drawn out of the canister via a hose into the carburettor to be burnt by the engine.

TO CHECK EVAPORATIVE CONTROL SYSTEM

(1) Visually inspect the charcoal canister for damage or signs of leakage. Renew the canister as necessary.

(2) Inspect the vapour lines and connectors for signs of leakage, cracks or deterioration and renew as necessary.

(3) Check the vent container for cracks or deterioration and renew as necessary.

(4) Inspect the fuel tank filler cap seal for deterioration. Renew as necessary.

TO RENEW CHARCOAL CANISTER

(1) Raise the front of the vehicle and support it on chassis stands. Refer to the Wheels and Tyres section for the correct procedure.

(2) Suitably tag the canister hoses to aid assembly and detach them from the canister.

(3) Loosen but do not remove the right hand canister bracket attaching bolt.

(4) Loosen the canister bracket clamp bolt sufficiently to allow the canister to be withdrawn from the bracket.

Installation is a reversal of the removal procedure.

PRODUCTION CHANGES

This supplement provides additional information pertaining to later JB Camira models. Since production changes make it difficult to determine which units are fitted to individual vehicles the owner should thoroughly read the supplement, compare it to the main manual and determine which section applies to the particular vehicle being serviced.

Specifications and procedures not listed in this supplement remain unchanged from those in the main manual.

SPECIFICATIONS

Steering gear type	Rack and pinion with integral power cylinder
Lubricant	Dexron IID
Linkage	Direct from rack to tie rods and steering arms
Turns lock to lock	3.3
Total rack travel	154 mm
Steering pump:	
Make	Saginaw
Type	Positive displacement vane impeller
Pressure at idle	6890–7579 kPa
Drive	V belt and pulley

TORQUE WRENCH SETTINGS

Steering gear mounting nuts	20 Nm
Steering shaft to pinion shaft flexible coupling bolts	27 Nm
Fluid line flare nuts	40 Nm
Steering pump mounting bolts	27 Nm
Steering pump adjusting bolt	27 Nm
Steering pump adjustor locknut	27 Nm
Steering pump adjusting bracket to support bracket bolts	34 Nm
High pressure fluid line to pump bolt	48 Nm
Air conditioning compressor pivot bolts	54 Nm
Air conditioning compressor adjusting bolt	27 Nm
Air conditioning compressor bracket to support bracket bolts and nuts	34 Nm

1. DESCRIPTION

The power steering gear is a constant ratio rack and pinion type incorporating a torsion bar and rotary control valve and spool to control and direct the hydraulic pressure to the appropriate side of the power piston. The power piston operates in a cylinder which is incorporated in the rack housing.

Hydraulic pressure is supplied to the power steering gear by a pump which is driven by the engine crankshaft pulley via a V belt. A fluid reservoir is located on the left hand inner fender panel to the rear of the engine coolant surge tank.

No lubrication of the steering gear is required in service and in the event of a loss of power assistance the steering will continue to operate but with greatly increased effort. However, as the steering gear and pump are lubricated by the power steering fluid, the cause of fluid loss must be determined and repaired promptly to prevent damage to the power steering pump and, to a lesser extent, the steering gear.

The tie rods are connected at one end to the rack by bolts passing through rubber bushes and to the steering arms by sealed tie rod ends at the other end.

The assembly is protected against the entry of water and dust by a seal on the pinion shaft and by corrugated boots fastened by clips to the steering gear housing and the centre cover.

The steering column shaft is connected to the steering gear by a flexible coupling and is designed to absorb secondary impact in the event of a severe front end collision.

2. PRELIMINARY INSPECTION AND TESTING

If the power steering system becomes partially or fully inoperative it is most important that the following preliminary inspection and testing procedure be performed prior to undertaking any major trouble shooting or repair operations.

PUMP DRIVE BELT/S

Inspect the pump drive belt/s for breakage, glazing and wear. Renew the belt if any of these characteristics are evident, using only a genuine replacement belt of the specified type. If the drive belt/s is loose but still serviceable, adjust it as described under In Car Adjustment And Minor Repairs.

NOTE: In most cases loose drive belts can be heard squealing when a load is placed on the pump as the steering wheel is turned, particularly on full lock, or as the engine speed is suddenly increased.

TO CHECK FLUID LEVEL

The fluid level is checked at the fluid reservoir when the fluid is at operating temperature. The fluid level must be between the Min and Max level indicators marked on the reservoir body. The fluid may be considered at operating temperature if the vehicle has been driven for over 20 minutes.

- (1) Make sure the vehicle is level. Inspect the amount indicated on the reservoir body.
- (2) If the fluid level is low, clean around the reservoir cap and remove the cap.
- (3) Top up with the specified fluid. Do not overfill.
- (4) If the reservoir is dry, the system must be bled as described under In Car Adjustment And Minor Repairs.
- (5) To avoid damage to the sealing ring do not over-tighten the reservoir cap.

TO CHECK FOR FLUID LEAKS

Using a suitable solvent clean around all the power steering assemblies and hose fittings where fluid leakage may occur and start the engine.

Turn the steering wheel from lock to lock several times, contacting the lock stops lightly and stop the engine.

Check for leakage. Where leakage is found at hose fittings, tighten and recheck. Where leakage is found at the steering pump, specialist attention is necessary.

3. IN CAR ADJUSTMENT AND MINOR REPAIRS

PUMP DRIVE BELT/S TENSION

- (1) Check the drive belt/s tension as described in the Engine Tune-up section of the main manual.

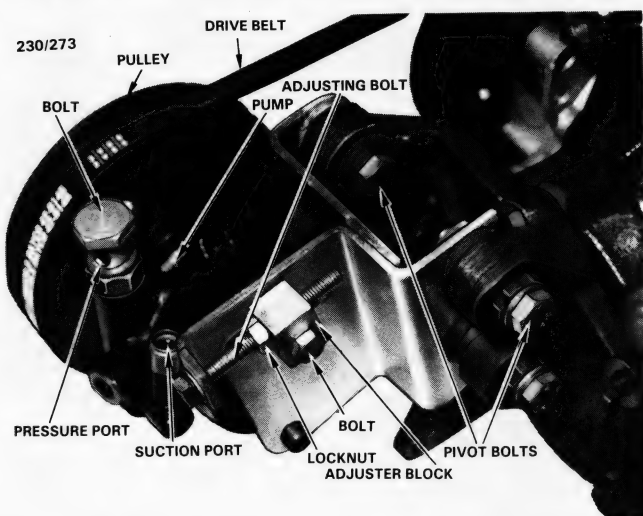
- (2) If necessary adjust the drive belt/s as follows:

Non Air Conditioned Models

(1) Loosen the pump pivot bolts, the adjustor bolt lock nut and the bolt retaining the adjustor block to the pump.

(2) Turn the adjustor bolt until the correct belt tension is achieved.

(3) Tighten the pump pivot bolts, the adjustor locknut and the bolt retaining the adjustor block to the pump.



Installed view of power steering pump. Non air conditioned model.

Air Conditioned Models

(1) Loosen the air conditioning compressor pivot and the adjustor bolts and nuts.

(2) Using a suitable lever, move the compressor outwards until the correct belt tension on one belt is achieved.

NOTE: Do not lever on the power steering pump or the air conditioner compressor bodies. Lever against the air conditioner compressor mounting lugs.

(3) Securely tighten the pivot bolts and nuts and the adjustor bolts and nuts.

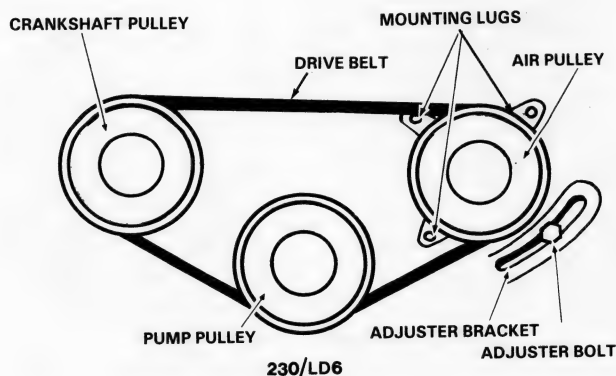


Illustration showing adjusting method for air conditioned models.

(4) Check the tension of the second belt. If there is an appreciable difference between the tension of both belts, both belts must be renewed using genuine replacement belts of the specified type.

(5) If new belt/s have been fitted run the engine for 10 minutes and recheck the belt tension.

TO BLEED SYSTEM

(1) Check the fluid level and top up if necessary, as previously described.

(2) Raise the front of the vehicle so that the front wheels are clear of the ground and support it on chasis stands.

(3) With the engine stopped turn the steering wheel from lock to lock several times. Top up the fluid as necessary. Repeat until the fluid level remains constant.

(4) Start the engine. With the engine at idle speed, turn the steering wheel from lock to lock several times, contacting the lock stops lightly.

(5) When no air bubbles appear in the fluid reservoir and the fluid level remains constant the system can be considered bled.

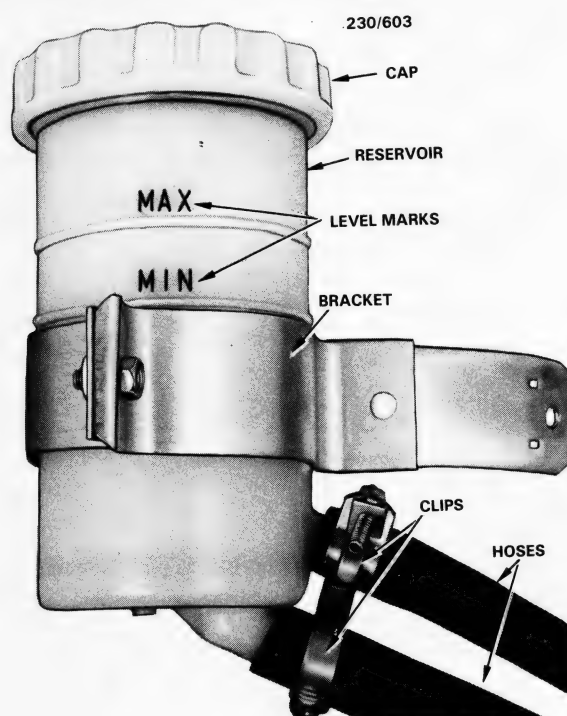
(6) Turn the wheels to the straight ahead position, stop the engine and lower the vehicle to the ground.

TO REMOVE AND INSTAL POWER STEERING RESERVOIR

(1) Disconnect the negative battery terminal.

(2) Place a suitable container under the reservoir and loosen the two hose clips.

(3) Remove the lower hose and drain the fluid into the container. Remove the remaining hose.



Power steering reservoir removed from the vehicle.

Suitably plug both hoses to prevent excess fluid loss and the entry of dirt.

(4) Remove the reservoir clamp bolt and the bolt retaining the coolant surge tank and reservoir clamp to the fender inner panel and remove the clamp. Withdraw the reservoir from the engine compartment.

Installation is a reversal of the removal procedure with attention to the following point:

Refill the reservoir and bleed the system as previously described using new fluid of the type specified.

TO REMOVE AND INSTALL POWER STEERING HOSES

- (1) Place a suitable container under the reservoir.
- (2) Loosen the clip retaining the low pressure hose (lower hose) to the reservoir. Remove the hose and drain the fluid from the reservoir.
- (3) Remove the clips securing the high and low pressure hoses to each other below the surge tank.
- (4) Remove the bolt retaining the high pressure hose to the power steering pump.
- (5) Loosen the clip retaining the low pressure hose to the power steering pump and remove the hose from the pump.
- (6) Gently work the hoses out of the support brackets located near the pump at the rear of the engine block and the rear of the transaxle and withdraw the low pressure hose from the engine compartment.
- (7) Remove the clips retaining the steel sections of the high pressure and fluid return hoses to the fluid pipes on the steering gear assembly.
- (8) Remove the unions retaining the steel sections of the high pressure and the fluid return hoses and withdraw the high pressure hose from the engine compartment.
- (9) Loosen the clip retaining the fluid return hose to the reservoir and withdraw the hose from the engine compartment.

Installation is a reversal of the removal procedure with attention to the following points:

- (1) Use new sealing washers at the bolt retaining the high pressure hose to the power steering pump.
- (2) Use new fluid of the specified type and bleed the system as previously described.

4. POWER STEERING PUMP

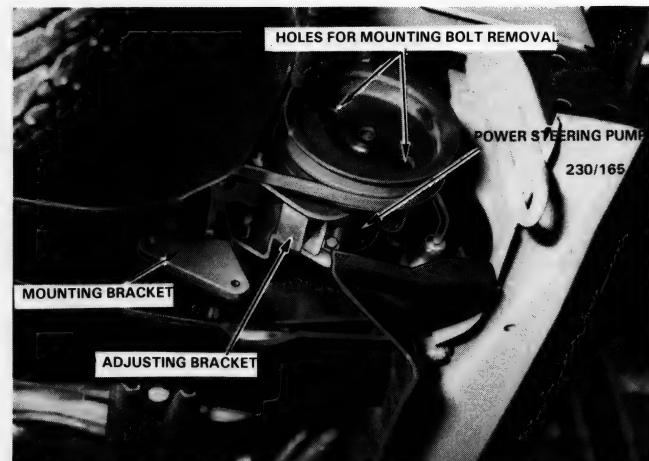
As extensive knowledge and equipment is required to overhaul the power steering pump, it is not a worthwhile repair proposition for the average person.

However if the power steering pump is to be removed for overhaul by a specialist or if it is to be replaced by an exchange unit, the removal and installation procedures are described later in this section.

TO REMOVE AND INSTALL

Non Air Conditioned Models

- (1) Disconnect the negative battery terminal.



Installed view of power steering pump on non air conditioned model.

- (2) Raise the front of the vehicle and support it on chassis stands.
- (3) Place a suitable container under the pump and disconnect the two hoses from the pump. Plug the hoses to prevent excess fluid loss and the entry of dirt.
- (4) Loosen the pump pivot bolts, the adjustor lock-nut and the bolt retaining the adjustor block to the pump.
- (5) Wind the adjustor bolt in to release the belt tension and remove the belt from the pump pulley.
- (6) Remove the pump pivot bolts and the adjustor block retaining bolt and lower the pump from the adjustor bracket.

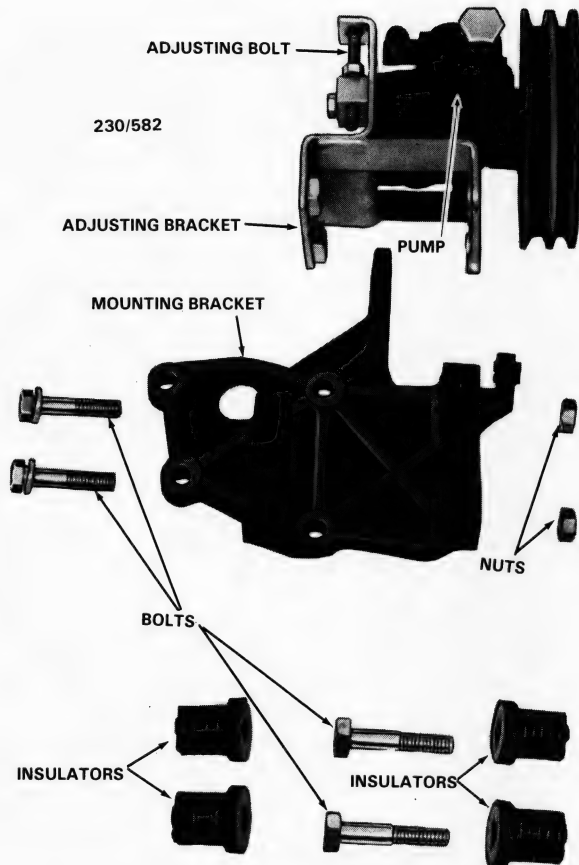
NOTE: Remove the lower front pump pivot bolt through one of the holes in the pump pulley.

Installation is a reversal of the removal procedure with attention to the following points:

- (1) Use new sealing washers at the bolt retaining the high pressure hose to the pump.
- (2) Use new fluid of the specified type and bleed the system as previously described.
- (3) Adjust the belt as outlined in In Car Adjustment And Minor Repairs.

Air Conditioned Models

- (1) Disconnect the negative battery terminal.
- (2) Raise the front of the vehicle and support it on chassis stands.
- (3) Loosen the air conditioning compressor pivot bolts and nuts and the adjustor bolt and nut.
- (4) Swing the air conditioning compressor in and remove the drive belts from the pulley then swing the compressor out clear of the power steering pump. If necessary tie the compressor back with a suitable piece of string or tie wire.
- (5) Place a suitable container under the power steering pump and remove the two hoses. Plug the hoses to prevent excess fluid loss and the entry of dirt.
- (6) Remove the bolts retaining the pump to the mounting bracket and lower the pump from the mounting bracket.



Power steering pump and mounting bracket removed from the vehicle.

NOTE: Remove the upper front pump retaining bolt through one of the holes in the pump pulley.

Installation is a reversal of the removal procedure with attention to the following points:

- (1) Use new sealing washers at the bolt retaining the high pressure hose to the pump.
- (2) Use new fluid of the specified type and bleed the system as previously described.
- (3) Adjust the belts as outlined in In Car Adjustment And Minor Repairs.

5. POWER STEERING GEAR ASSEMBLY

Special Equipment Required:

To Remove Fluid Pipe Unions – Suitable holder

To Instal Holder Assembly Seals – Suitable seal replacing tools

TO RENEW DUST BOOTS

The removal and installation procedures are similar to those outlined in the main manual under Steering with attention to the following points:

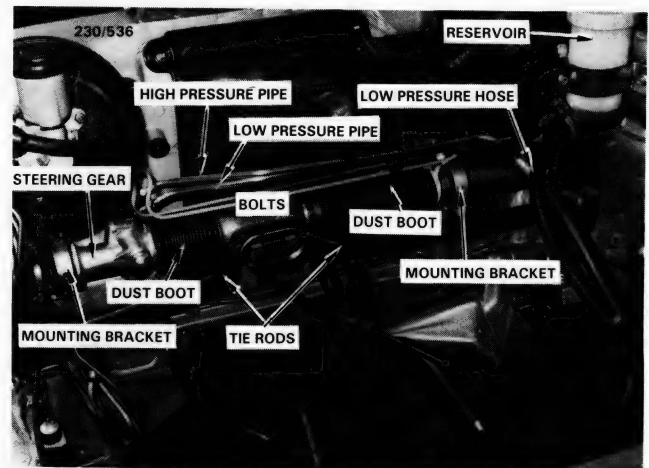
- (1) Remove the unions retaining the fluid pipes on the rack assembly to the control valve housing assembly.
- (2) Remove the unions retaining the fluid pipes to

the left hand side of the steering gear and remove the fluid pipes.

- (3) Upon installation, top up with new fluid of the specified type and bleed the system as previously described.

TO REMOVE AND INSTAL

The removal and installation procedures are similar to those outlined in the main manual under Steering with attention to the following points:



Installed view of power steering gear.

- (1) Remove the unions retaining the steel sections of the high pressure and fluid return hoses to the control valve housing assembly. Remove the clip retaining the hoses to the fluid pipes on the steering gear assembly. Suitably plug the hoses to prevent excess fluid loss and the entry of dirt.

- (2) Upon installation, top up with new fluid of the specified type and bleed the system as previously described.

TO DISMANTLE

- (1) Remove the steering gear from the vehicle as previously described and thoroughly clean the outer surfaces of the steering gear in a suitable cleaning solvent.

- (2) Clamp the flanges of the right hand mounting bracket end in a vice fitted with soft jaws to support the steering gear during overhaul. The steel tube section of the steering gear should not be gripped in the vice as damage to the outer tube may result.

- (3) Using a suitable hammer and drift, knock back the lock washer tabs from the heads of the tie rod retaining bolts.

- (4) Suitably mark the tie rods to ensure their correct assembly. Remove the tie rod attaching bolts, lock washer and plate from the steering gear and remove the tie rod assemblies from the steering gear.

- (5) Suitably mark the fluid pipes at the end of the rack housing and control valve housing to aid assembly.

- (6) Place a suitable container under the steering gear to catch excess fluid.

- (7) Fit a suitable holding tool around the fluid pipes

at the end of the steering gear to stop the cylinder turning while loosening the unions on the fluid pipes.

(8) Disconnect the fluid pipes at the end of the steering gear and the control valve housing and remove the fluid pipes from the steering gear.

(9) Instal one of the tie rod mounting bolts into the rack and move the rack towards the control valve end to drain excess fluid. Remove the bolt.

(10) Remove the dust cap from the control valve end by working it up and down while pulling outward.

(11) Remove the dust cap 'O' ring from the rack housing using a suitable small screwdriver.

(12) Loosen the wire clips retaining the boots to the steering gear at the outer ends and slide the rack boots and tube away from the control valve end and off the steering gear assembly.

(13) Remove the bearing assembly from the rack housing.

(14) Loosen the rack pad adjusting screw locknut and remove the adjusting screw, spring and pad from the rack housing.

(15) Remove the bolts securing the control valve assembly to the rack housing and wind the control valve away from the rack housing.

(16) Remove and retain any adjusting shims that may have been fitted between the control valve assembly and the rack housing.

(17) Remove the cylinder assembly retaining ring by working a thin feeler strip under the retaining ring and working the ring out with a small screwdriver.

(18) Temporarily fit one of the fluid pipes back into the cylinder to use as a handle and extract the cylinder from the rack housing.

(19) Remove the rack and piston assembly from the cylinder end of the rack housing. It may be necessary to lightly tap the rack from the control valve end with a suitable drift and hammer, being careful not to damage the rack housing with the rack teeth while removing the rack.

(20) Mount the rack and piston assembly in a vice fitted with soft jaws at the tie rod attaching points.

(21) Hold the rack with an open end spanner fitted to the flats on the rack and remove the nut retaining the piston to the rack.

(22) Remove the piston from the rack.

(23) Ensure that there are no burrs on the rack surface and slide the holder assembly off the rack.

TO CLEAN AND INSPECT

(1) Thoroughly clean all the parts in white spirit.

(2) Inspect the rack teeth and sealing surface for wear, damage and scoring.

(3) Inspect the inner teflon seal on the holder assembly for wear, damage and scoring.

(4) Inspect the piston and seal for wear, damage and scoring.

(5) Inspect the rack housing inner wall for wear, damage and scoring.

(6) Inspect the cylinder inner wall for wear, damage and scoring.

(7) Inspect the control valve assembly and fluid pipe seats for wear, damage and scoring.

(8) Inspect the dust boots for splits and damage.

(9) Renew all worn or damaged parts as necessary.

(10) To renew the seals on the holder assembly proceed as follows:

(a) Remove the inner and outer seals from the holder assembly using a sharp knife.

(b) Liberally coat the inner seal with Shell Alvania EP2 grease and insert the seal using suitable special tools. Ensure that the lip of the seal faces toward the holder assembly.

(c) Remove the special tools and check that the inner seal is seated correctly.

(d) Coat the outer 'O' ring seal with Shell Alvania EP2 grease and instal it in the groove in the holder assembly outer diameter.

(11) To renew the rack piston seal proceed as follows:

(a) Remove the seal from the rack piston using a sharp knife.

(b) Slightly expand the seal and coat it with Shell Alvania EP2 grease.

(c) Instal the seal in the groove in the piston.

(d) Compress the seal by pushing the piston and seal assembly into a suitable compressor.

TO ASSEMBLE

(1) Lubricate all seals, 'O' rings and valve and piston rings with Dexron IID.

(2) Instal the seal replacing tool to the end of the steering rack and slide the holder assembly onto the rack. Remove the seal replacing tool.

(3) Mount the rack in a vice fitted with soft jaws, at the tie rod attaching points.

Instal the piston assembly to the rack.

(4) Instal a new self locking nut to the rack and, holding the rack with an open ended spanner applied to the flats on the rack, tighten the nut to 54 Nm.

(5) Mount the rack housing in a vice at the right hand mounting bracket end.

(6) Instal the rack into the rack housing leaving the piston protruding.

(7) Coat a new 'O' ring with Shell Alvania EP2 grease and fit it to the cylinder assembly.

(8) Slide the cylinder assembly over the piston and push the cylinder into the rack tube.

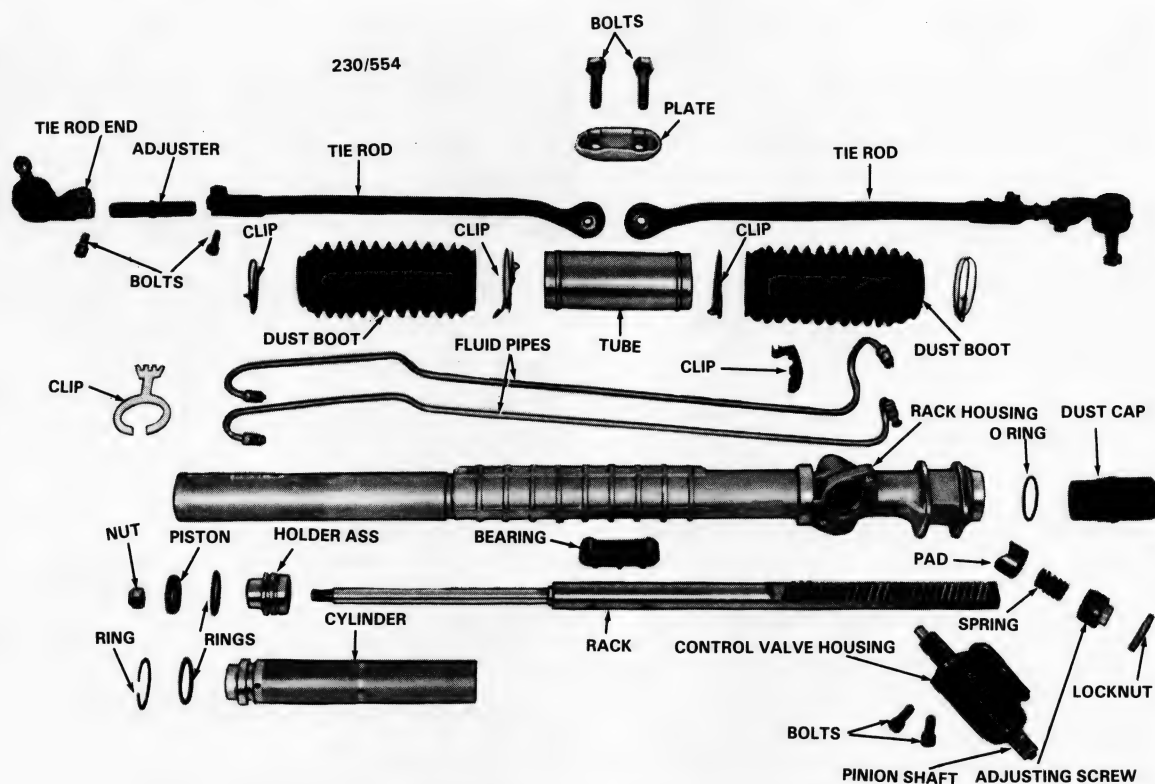
(9) Instal the cylinder retaining ring into the rack housing.

(10) Position the rack centrally in the rack housing and instal the bearing assembly on the rack.

(11) Temporarily instal the two tie rod retaining bolts to the rack and position the rack centrally in the rack housing by measuring the distance from the edge of the bearing assembly to the bearing stop surface on the rack housing aperture at both sides.

(12) Pack the pinion gear teeth and ball bearing on the control valve assembly with Shell Alvania EP2 grease.

(13) If shims were removed during dismantling,



Dismantled view of the power steering gear.

replace them in the rack housing counterbore.

(14) Apply a thin coating of Three Bond No. 1105 liquid sealant to the control valve assembly and rack housing mating surfaces.

(15) Keeping the rack in the central position, install the control valve assembly in the rack housing by turning the pinion shaft back before installation to allow for the turn of the shaft as the control valve is pushed into position. The recess in the pinion shaft to allow for the installation of the flexible coupling clamp bolt must be aligned with the axis of the rack and facing the rack pad adjusting screw when the control valve assembly is secured to the rack housing and the rack is in the central position.

(16) Install the control valve retaining bolts and torque to 25 Nm.

(17) Coat the friction surface of the rack adjusting pad, the spring and the spring seat in the adjusting screw with Shell Alvania EP2 grease and install the pad, spring and screw into the rack housing.

(18) Ensure that the rack is in the central position and torque the adjusting screw to 7.3 Nm and back off the screw. Repeat this operation several times to ensure that the rack is properly seated.

(19) Finally torque the adjusting screw to 7.3 Nm and back off the adjusting screw 30–35 degrees to obtain the correct clearance.

(20) Using a suitable adaptor, connect a torque wrench to the pinion shaft. Check that a torque of 0.39–

13.7 Nm is required to turn the pinion shaft and is consistent over the full travel of the rack. If the reading is outside the specification, adjust the screw to obtain the correct turning effort.

(21) Suitably mark the adjusting screw and the rack housing to ensure that the adjusting screw does not move when tightening the locknut.

(22) Coat the threads of the adjusting screw with Three Bond No. 1102 liquid sealer and install and torque the locknut to 67 Nm ensuring that the adjusting screw does not move.

(23) Remove the tie rod retaining bolts from the rack and slide the dust boot and tube assembly over the rack housing.

(24) Locate the dust boot ends in the grooves in the rack housing and secure the ends with tie wire.

(25) Install the fluid pipes to the control valve assembly and cylinder assembly noting the correct position as marked prior to removal.

(26) Fit a suitable holding tool around the fluid pipes at the cylinder assembly end and tighten the unions securely.

(27) Tighten the unions at the control valve securely.

(28) Coat the dust cap seal with Shell Alvania EP2 grease and install it into the rack housing at the control valve end.

(29) Push the dust cap firmly into place ensuring the groove engages with the dust cap seal.

SPECIFICATIONS

Station Wagon front stabiliser bar diameter:

Steel wheels 21 mm

Alloy wheels and 60 series tyres 19 mm

Station Wagon rear coil spring identification ZH

Station Wagon rear shock absorber:

Identification JB

Color Black

Type Telescopic, hydraulic

1. REAR COIL SPRINGS

The rear springs fitted to Station Wagon models have revised load ratings and can be identified by tags, attached to the springs which carry the identification code listed under Specifications.

The removal, installation and inspection procedures are as detailed in the main manual.

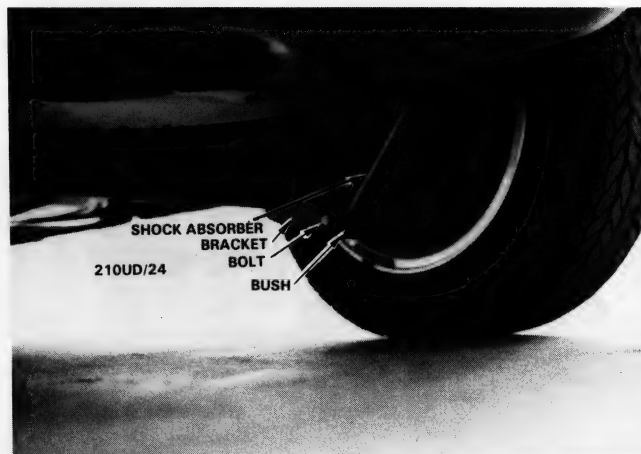
2. REAR SHOCK ABSORBERS

The shock absorbers fitted to Station Wagon models have revised mountings.

The upper mounting has a bush pressed into the eye of the shock absorber which slides onto a pivot bracket attached to the underbody and is retained by a nut and washer. Special equipment is needed to renew the shock absorber bushes.

The lower mounting bush is angle mounted and pivots on a bolt attached to a bracket which is welded to the rear axle housing.

The removal, installation and inspection procedures



Rear shock absorber lower mounting. Station Wagon.

are as detailed in the main manual except that reference to the top mounting should be deleted and the following procedure used:

(1) Remove the retaining nut and washer from the underbody pivot bracket.

(2) Slide the shock absorber upper mounting from the underbody pivot bracket.

3. FRONT STABILISER BAR

STATION WAGON

To Remove, Instal and Inspect

The removal, installation and inspection procedures are as detailed in the main manual.

1. REAR COMBINATION LAMP

STATION WAGON

To Renew Bulb

- (1) Lift the tailgate.
- (2) Remove the screws retaining the combination lamp to the vehicle body and withdraw the lamp sufficiently to allow access to the bulb sockets.
- (3) Depress the locking lever and turn the bulb socket in the direction of the removal arrow.
- (4) Remove the bulb from the bulb socket by pushing the bulb slightly in and turning it anti-clockwise.
- (5) Install the new bulb, ensuring that it is the correct wattage and voltage. If replacing a stop/tail lamp bulb ensure that it is fitted correctly, as the locating pins on the bulb are offset.
- (6) Refit the bulb socket and bulb to the lamp body and turn the bulb socket in the direction of the install arrow until an audible click is heard.
- (7) Install the lamp assembly and tighten the retaining screws securely.

To Remove and Install

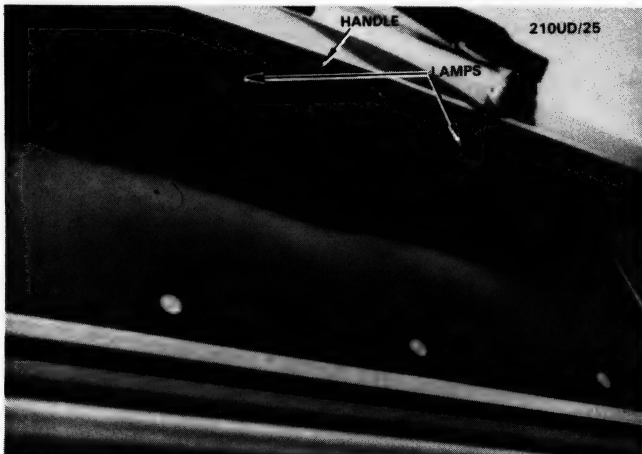
- (1) Lift the tailgate and remove the relevant rear quarter trim panel.
- (2) Disconnect the lamp assembly electrical connector.
- (3) Remove the screws retaining the lamp assembly to the body.
- (4) Withdraw the lamp assembly from the body. Installation is a reversal of the removal procedure.

2. NUMBER PLATE AND REVERSE LAMP ASSEMBLY

STATION WAGON

To Renew Number Plate Lamp Bulb

- (1) Remove the retaining screws underneath the tailgate handle and withdraw the handle from the vehicle.



Installed view of number plate lamps.

- (2) Remove the bulb by holding the socket and pulling the bulb. Do not push and twist.

- (3) Check the socket terminals for corrosion and install the new bulb by pushing it into the socket.

- (4) Install the tailgate handle and tighten the retaining screws securely.

To Renew Reverse Lamp Bulb

- (1) Remove the retaining screws underneath the tailgate handle and withdraw the handle from the vehicle.

- (2) Remove the screws retaining the relevant lens and remove the lens.

- (3) Remove the bulb from the bulb socket by pushing the bulb slightly in and turning it anti-clockwise. Do not touch the reflective silver paint finish on the lamp base.

- (4) Check the socket terminals for corrosion and install the new bulb, ensure that it is the correct wattage and voltage.

- (5) Install the reverse lamp lens.

- (6) Install the tailgate handle and tighten the retaining screws securely.

To Remove and Install Lamp Assembly

- (1) Remove the tailgate inner trim panel as described in the Body section under Tailgate — To Remove and Install, and disconnect the number plate and reverse lamps wiring.

- (2) Remove the retaining screws underneath the tailgate handle and withdraw the handle from the vehicle.

- (3) Remove the tailgate lock cylinder as detailed in the Body section of this supplement.

- (4) Remove the nuts and screws securing the lamp assembly to the tailgate and withdraw the lamp assembly.

Installation is a reversal of the removal procedure with attention to the following points:

- (1) Check all the lamps for correct operation and check the operation of the tailgate handle and lock mechanism before installing the tailgate inner trim panel.

- (2) Tighten all screws and nuts securely.

3. REAR WINDOW WIPER ASSEMBLY

TO REMOVE AND INSTALL

- (1) Disconnect the negative battery terminal. Lift the cover concealing the wiper arm retaining nut and remove the nut.

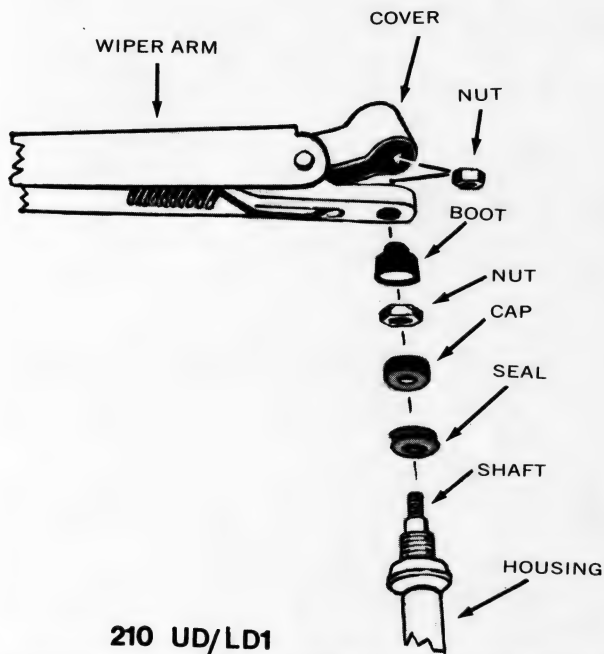
- (2) Prise the wiper arm from the wiper motor shaft being careful not to damage the surrounding body panel.

- (3) Remove the rubber boot from the wiper motor shaft.

- (4) Remove the sealing nut, the cap and the seal from the wiper motor shaft housing.

- (5) Open the tailgate and remove the trim panel. Refer to Tailgate — To Remove and Install in the Body section.

- (6) Remove the wiper assembly retaining bolts and withdraw the wiper assembly from the vehicle.



210 UD/LD1
Schematic diagram of rear window wiper arm and wiper motor shaft housing components.

Installation is a reversal of the removal procedure with attention to the following points:

- (1) Torque the wiper assembly retaining bolts to 6 Nm.
- (2) Torque the wiper arm retaining nut to 10.6 Nm.
- (3) Do not overtighten the wiper motor shaft housing sealing nut.
- (4) With the wiper assembly in the Park position, instal the wiper arm parallel to and 40 mm from the paint line at the base of the window.

4. REAR WINDOW WASHER

TO REMOVE AND INSTAL

- (1) Remove the snap fit trim cover from the right hand rear corner in the inside of the vehicle.
- (2) Remove the wiring connector from the pump by pulling on the connector, not the wires.
- (3) Remove the water hose from the pump and block the outlet to prevent spillage.
- (4) Lift the washer reservoir and pump assembly from the vehicle.

Installation is a reversal of the removal procedure with attention to the following points:

- (1) Ensure that the wiring connection to the pump is firm and clean.
- (2) Top up the liquid in the washer reservoir.

5. NEUTRAL SAFETY SWITCH AUTOMATIC TRANSAXLE MODELS

DESCRIPTION

The neutral safety switch is wired in series with the starter motor solenoid to ensure that the engine can be started

only with the transaxle in the P or N positions. A reverse lamp switch is also incorporated in the switch body. The switch is mounted on the transaxle case below the transaxle selector lever and is activated by the transaxle selector shaft. The switch is not adjustable or repairable. Therefore if its operation is faulty, it should be renewed.

TO TEST

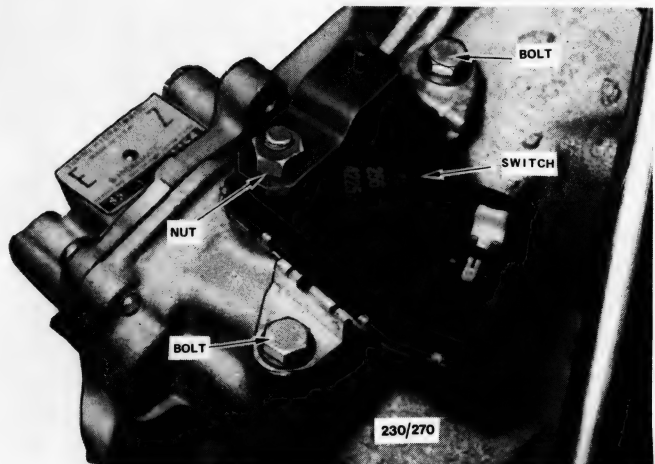
- (1) Remove the retaining pin from the wiring connector.
- (2) Prise up the tag on the connector and remove the connector.
- (3) Position the selector lever in the N position.
- (4) Select the two terminals on the switch corresponding to the two violet coloured wires on the connector and connect ohmmeter probes to the terminals and test for continuity.
- (5) Repeat the same test in the P position.

NOTE: There should be no continuity in the circuit if the selector lever is placed in L, S, D or R.

- (6) Perform the same test as above now using the terminals corresponding to the pink and light green wires on the connector. Continuity should be present in the R position only.

TO REMOVE AND INSTAL

- (1) Place selector in N position.
- (2) Remove the clip retaining the selector inner cable to the transaxle selector lever pin.
- (3) Loosen the nut retaining the selector cable assembly to the cable support bracket.
- (4) Disconnect the cable assembly from the support bracket and the inner cable from the transaxle selector lever pin.
- (5) Remove the nut retaining the transaxle selector lever pin.
- (6) Remove the nut retaining the transaxle selector lever to the selector lever shaft and remove the selector lever.



Installed view of the neutral safety switch.

(7) Remove the wiring connector as previously described.

(8) Remove the two bolts retaining the neutral safety switch to the transaxle case and remove the switch.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Ensure that the transaxle selector lever is in the N position.

(2) Instal the switch on the transaxle selector shaft ensuring the flats on the switch insert engage with the flats on the shaft.

(3) Loosely instal the two neutral safety switch

mounting bolts to the transaxle case.

(4) Insert a 2 mm drill shank into the reset hole and hold in with light finger pressure.

(5) Rotate the switch until the pin moves into the switch body.

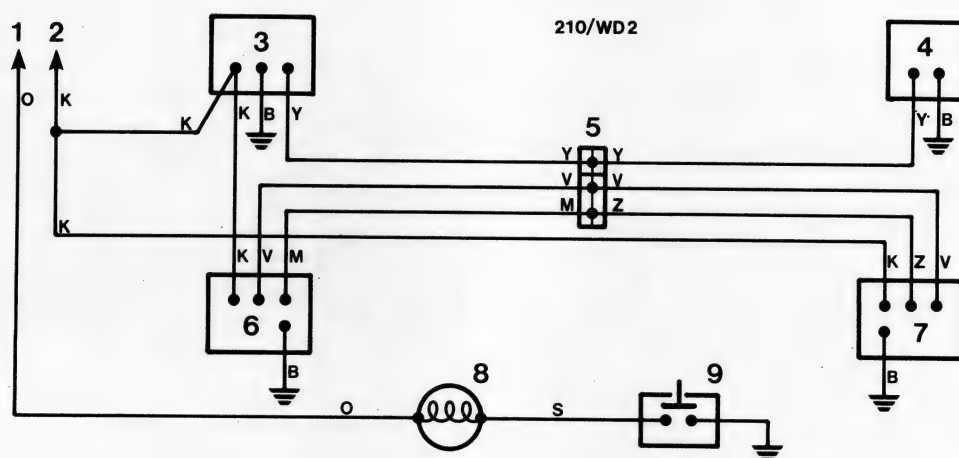
(6) Tighten the retaining bolts securely and remove the drill.

(7) Refit the wiring connector and retaining pin.

(8) Refit the transaxle selector lever and cable assembly.

(9) Check the selector cable adjustment and neutral safety switch operation.

6. WIRING DIAGRAM



KEY

1. To fuse No 9
2. To fuse No 11
3. Rear washer switch
4. Rear washer pump
5. Instrument panel harness connectors
6. Rear wiper switch
7. Rear wiper motor
8. Rear compartment lamp
9. Rear compartment lamp switch

COLOR CODE

The first letter of the code represents the main wire color, the other letters represent the trace colors.

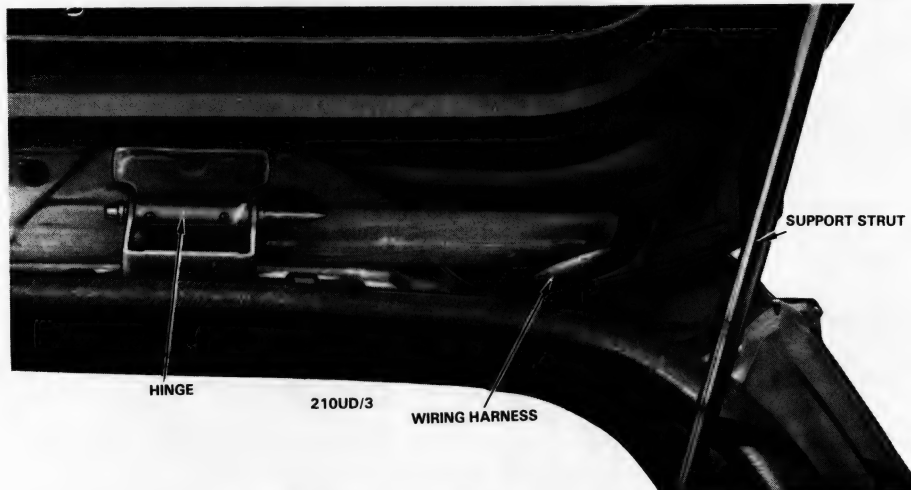
- B — BLACK
- L — BLUE
- G — GREEN
- R — RED
- Y — YELLOW
- W — WHITE
- N — BROWN
- O — ORANGE
- K — PINK
- S — GREY
- V — VIOLET
- P — PURPLE
- X — LIGHT GREEN
- Z — LIGHT BLUE
- M — DARK GREEN
- T — DARK BLUE
- A — LIGHT BROWN
- E — SLATE
- D — TAN

Supplementary wiring diagram for Station Wagon models.

1. TAILGATE

TO REMOVE AND INSTAL

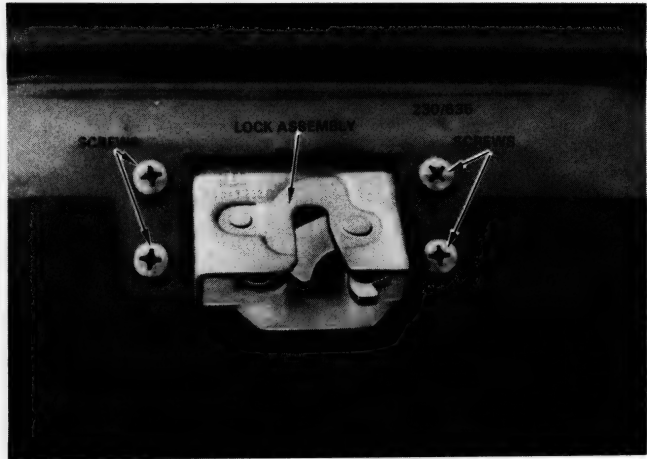
- (1) Disconnect the negative battery terminal.
 - (2) Raise the tailgate and remove the screws securing the tailgate trim panel to the bottom and sides of the tailgate.
 - (3) Ease the trim panel away from the tailgate and using a suitable wide bladed screwdriver, prise the retaining clips out of the tailgate at the upper edge of the trim panel.
 - (4) Remove the trim panel from the tailgate.
 - (5) Disconnect the wiring connectors from the reverse lamp, number plate lamp and, where fitted, wiper motor, rear window demister and speakers.
 - (6) On vehicles fitted with rear window wiper/washers, remove the screws retaining the washer nozzle to the tailgate and pull the nozzle out. Disconnect the washer hose from the nozzle and tie a piece of string to the hose to aid assembly.
 - (7) Remove the wiring harness grommet and wiring harness from the tailgate. To aid assembly, tie a piece of string to the end of the wiring harness before pulling the harness and washer hose through the pillar section of the tailgate.
 - (8) When the wiring harness and washer hose is free of the tailgate, untie the strings, leaving them in place in the tailgate.
 - (9) With the aid of an assistant, support the tailgate and unclip the spring clips retaining the support struts to the mounting balls on the tailgate and remove the struts.
 - (10) Knock out the hinge pins securing the tailgate to the roof mounted hinges.
 - (11) Remove the tailgate from the vehicle.
- Installation is a reversal of the removal procedure with attention to the following point:
- Tie the wiring harness and washer hose to the strings pulled through the tailgate panels prior to removal and pull the harness and hose through the pillar section of the tailgate while guiding them through the upper hole in the tailgate.



Installed view of tailgate components.

TO ADJUST HEIGHT

- (1) Remove the screws retaining the tailgate opening upper inner trim panel to the body and remove the trim panel.
- (2) Remove the nuts and washers retaining the hinges to the roof panel.
- (3) Slightly raise the tailgate and instal or remove the shims between the tailgate hinges and the roof panel to achieve a proper fit of the tailgate.
- (4) Apply a suitable non hardening sealer to the roof panel around the hinge studs, replace the washers and nuts and tighten securely.
- (5) Replace the tailgate upper inner trim panel.



Installed view of tailgate lock.

TO REMOVE AND INSTAL LOCK

- (1) Remove the tailgate inner trim panel as previously described under Tailgate — To Remove and Instal.
- (2) Remove the screws retaining the lock assembly to the lower tailgate panel.
- (3) Disconnect the clips securing the connecting rod to the lock cylinder and lock assembly and remove the lock assembly from the tailgate.

Installation is a reversal of the removal procedure.

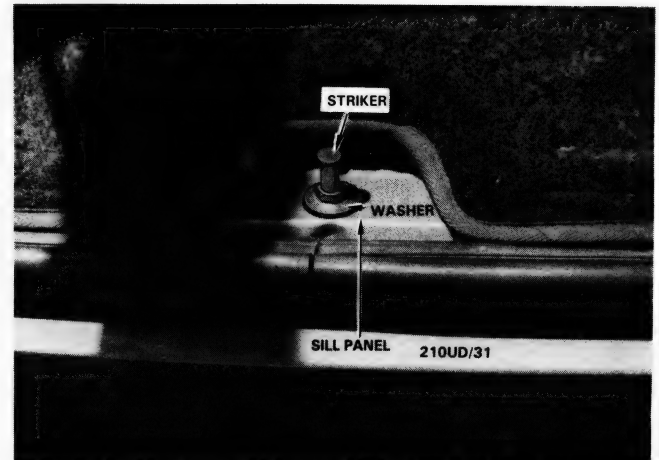
TO REMOVE AND INSTALL LOCK CYLINDER

- (1) Remove the screws retaining the tailgate lift handle to the tailgate and withdraw the handle from the vehicle.
- (2) Raise the tailgate and remove the tailgate inner trim panel as previously described under Tailgate — To Remove and Install.
- (3) Disconnect the clip retaining the connecting rod to the lock cylinder lever.
- (4) Remove the clip retaining the lock cylinder lever to the lock cylinder.
- (5) Remove the nut retaining the lock cylinder to the tailgate and remove the lock cylinder.

Installation is a reversal of the removal procedure.

TO ADJUST LOCK STRIKER

- (1) Open the tailgate and loosen the striker enough to allow a firm sliding fit.
- (2) Carefully close the tailgate observing that the striker is located centrally in the slot of the lock assembly.
- (3) If necessary, move the striker sideways to achieve a central location in the lock assembly.



Tailgate lock striker installed in the rear sill panel.

- (4) Observe the alignment of the tailgate to the surrounding body panels and move the striker in or out to achieve correct alignment.
- (5) On completion of the adjustment tighten the striker securely.

DESCRIPTION

Later model JB Camiras are fitted with production option V7Y which enables them to conform to NSW emission control requirements.

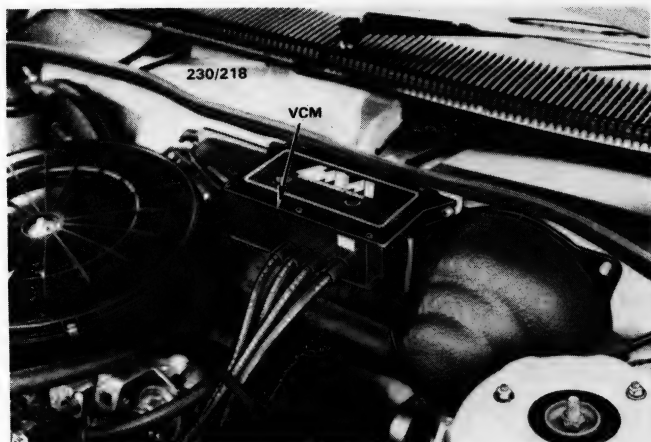
This production option introduces changes to the emission management system, the carburettor and the evaporative emission control circuit.

The emission management system has a revised ECM (Electronic Control Module) which begins to function on signals of vehicle speed instead of engine rpm as was the case previously.

The VCM (Vacuum Control Module) has been altered in the following manner: The port on the side of the VCM, marked C, has been blocked and the hose from this port to the Tee connection in the EGR TVS to port B hose has been deleted.

The automatic choke cover setting on the carburettor has been altered and the initial setting is now two graduations on the lean side of the centre division mark.

The carburettor vacuum break setting is as described



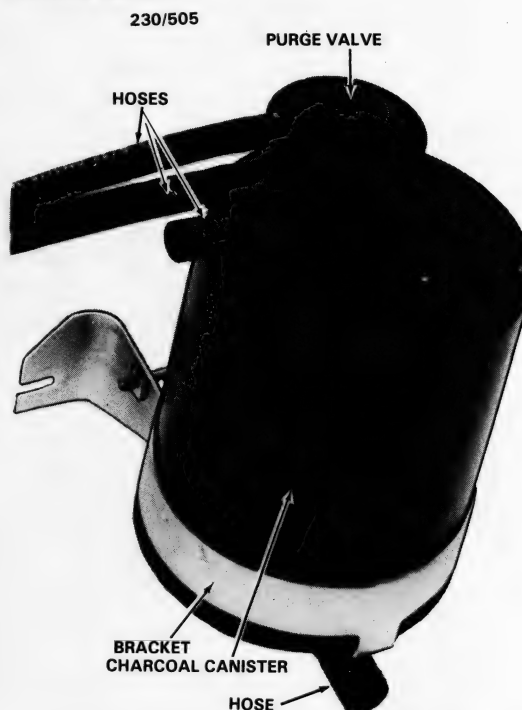
Installed view of VCM (Vacuum Control Module).

in the main manual Fuel System section except the gap should be 4.2 mm.

The second step setting is as described in the main manual Fuel System section except the gap should be 3.7 mm.

The evaporative emission control circuit has a purge valve built onto the charcoal canister. Purge valve signal vacuum is supplied by a hose connected to the EGR TVS to carburettor hose.

All other components and functions of the emission control system are as described in the main manual Emission Control section.



Charcoal canister removed from the vehicle.

CONVERSION TABLES

213

Quantity	Imperial Unit	Metric Unit	Conversion Factors (Approximate)	
			Imperial to Metric Units	Metric to Imperial Units
LENGTH	inch (in)	millimetre (mm) or centimetre (cm)	1 in = 25.4 mm	1 cm = 0.394 in
	foot (ft)	centimetre or metre (m)	1 ft = 30.5 cm	1 m = 3.28 ft
	yard (yd)	metre (m)	1 yd = 0.914 m	1 m = 1.09 yd
	furlong (fur)	metre (m) or kilometre (km)	1 fur = 201 m	1 km = 4.97 fur
	mile (for navigation)	kilometre (km) international nautical mile (n mile)	1 mile = 1.61 km 1 n mile = 1852 m	1 km = 0.621 mile
MASS	ounce (oz)	gram (g)	1 oz = 28.3 g	1 g = 0.0353 oz
	pound (lb)	gram (g) or kilogram (kg)	1 lb = 454 g	1 kg = 2.20 lb
	stone	kilogram (kg)	1 stone = 6.35 kg	1 kg = 0.157 stone
	ton	tonne (t)	1 ton = 1.02 t	1 t = 0.984 ton
AREA	square inch (in ²)	square centimetre (cm ²)	1 in ² = 6.45 cm ²	1 cm ² = 0.155 in ²
	square foot (ft ²)	square centimetre (cm ²) or square metre (m ²)	1 ft ² = 929 cm ²	1 m ² = 10.8 ft ²
	square yard (yd ²)	square metre (m ²)	1 yd ² = 0.836 m ²	1 m ² = 1.20 yd ²
	perch (p)	square metre (m ²)	1 p = 25.3 m ²	1 m ² = 0.0395 p
	rood (rd)	hectare (ha)	1 rd = 0.101 ha	1 ha = 9.88 rd
	acre (ac)	hectare (ha)	1 ac = 0.405 ha	1 ha = 2.47 ac
	square mile	square kilometre (km ²)	1 square mile = 2.59 km ²	1 km ² = 0.386 square mile
VOLUME	cubic inch (in ³)	cubic centimetre (cm ³)	1 in ³ = 16.4 cm ³	1 cm ³ = 0.0610 in ³
	cubic foot (ft ³)	cubic metre (m ³)	1 ft ³ = 0.0283 m ³	1 m ³ = 35.3 ft ³
	cubic yard (yd ³)	cubic metre (m ³)	1 yd ³ = 0.765 m ³	1 m ³ = 1.31 yd ³
	bushel (bus)	cubic metre (m ³)	1 bus = 0.0364 m ³	1 m ³ = 27.5 bus
VOLUME (fluids)	fluid ounce (fl oz)	millilitre (ml)	1 fl oz = 28.4 ml	1 ml = 0.0352 fl oz
	pint (pt)	millilitre (ml) or litre (l)	1 pt = 568 ml	1 litre = 1.76 pt
	gallon (gal)	litre (l) or cubic metre (m ³)	1 gal = 4.55 litre	1 m ³ = 220 gal
	acre foot	cubic metre (m ³) or megalitre (Ml)	1 acre foot = 1230 m ³ = 1.23 Ml	1 Ml = 0.811 acre foot
FORCE	pound-force (lbf)	newton (N)	1 lbf = 4.45 N	1 N = 0.225 lbf
	ton-force (tonf)	kilonewton (kN)	1 tonf = 9.96 kN	1 kN = 0.100 tonf
PRESSURE	pound per square inch (psi)	kilopascal (kPa)	1 psi = 6.89 kPa	1 kPa = 0.145 psi
	atmosphere (atm)	kilopascal (kPa) or megapascal (MPa)	1 atm = 101 kPa	1 MPa = 9.87 atm
	ton per square inch (ton/in ²)	megapascal (MPa)	1 ton/in ² = 15.4 MPa	1 MPa = 0.0647 ton/in ²
	psi	kg/cm ²	1 psi = 0.070 kg/cm ²	1 kg/cm ² = 14.22 psi
VELOCITY	mile per hour (mph)	kilometre per hour (km/h)	1 mph = 1.61 km/h	1 km/h = 0.621 mph
	(for navigation)	knot (kn)	1 kn = 1.85 km/h	
TEMPERATURE	temperature (°F)	temperature (°C)	°C = $\frac{5}{9} (°F - 32)$	°F = $\frac{9}{5} °C + 32$
DENSITY	pound per cubic inch (lb/in ³)	gram per cubic centimetre (g/cm ³) = tonne per cubic metre (t/m ³)	1 lb/in ³ = 27.7 t/m ³	1 t/m ³ = 0.0361 lb/in ³
	ton per cubic yard	tonne per cubic metre (t/m ³)	1 ton/yd ³ = 1.33 t/m ³	1 t/m ³ = 0.752 ton/yd ³
ENERGY	British thermal unit (Btu)	kilojoule (kJ)	1 Btu = 1.06 kJ	1 kJ = 0.948 Btu
	therm	megajoule (MJ)	1 therm = 106 MJ	1 MJ = 9.48 × 10 ⁻³ therm
	(for electrical energy)	kilowatt hour (kWh)	1 kWh = 3.60 MJ	
POWER	horsepower (hp)	kilowatt (kW)	1 hp = 0.746 kW	1 kW = 1.34 hp
TIME		second (s)		
		minute (min)	1 min = 60 s	
		hour (h)	1 h = 3600 s	
FREQUENCY	cycle per second (c/s)	hertz (Hz)	1 c/s = 1 Hz	1 Hz = 1 c/s
ANGULAR VELOCITY	revolution per minute (rpm)	radian per second (rad/s)	1 rpm = 0.105 rad/s	1 rad/s = 9.55 rpm
		revolution per minute (rpm)		
TORQUE	lb-ft	Nm	1 lb-ft = 1.35582 Nm	1 Nm = 0.737562 lb-ft
VACUUM	inches of mercury (in Hg)	kilopascal (kPa)	1 in Hg = 3.386 kPa	1 kPa = 0.295 in Hg

GLOSSARY OF NAMES AND TERMS

ENGINE

BIG END BEARINGS — Connecting rod bearings, con-rod bearings.
CAMSHAFT SPROCKET or **GEAR** — Timing gear, timing wheel.
CONNECTING ROD — Con-rod.
CRANKSHAFT SPROCKET or **GEAR** — Timing gear, timing wheel.
CYLINDER BLOCK — Crankcase, engine block.
END FLOAT — End play, end clearance.
ENGINE — Motor.
ENGINE STEADY — Stabiliser, support.
ENGINE MOUNTING — Mounts, supports.
FLYWHEEL RING GEAR — Starter ring gear, starter driven gear.
FUEL PUMP — Petrol pump.
GUDGEON PIN — Piston pin, wrist pin, small end pin.
INLET MANIFOLD — Intake manifold, induction manifold.
INLET VALVE — Intake valve, induction valve.
MAIN BEARING — Crankshaft bearing.
OIL CONTROL RING — Scraper ring, oil ring.
OIL PUMP (Rotor type) — Inner rotor, outer rotor.
OIL PUMP (Gear type) — Drive gear, driven gear.
O-RING — Neoprene O-ring, oil seal.
POWER UNIT — Engine and gearbox.
RELIEF VALVE — Release valve.
ROCKER ARM — Rocker, tappet.
ROCKER COVER — Valve cover, tappet cover.
SCREEN (Gauze type) — Filter.
SILENCER — Muffler, expansion box.
SMALL END — Little end.
SUMP — Oil pan.
TAPPET (Hydraulic or solid) — Valve lifter, cam follower.
TIMING CHAIN TENSIONER — Chain tightener.
VALVE COTTER — Valve collet, valve keep, valve key.
WATER PUMP IMPELLER — Rotor.
WELCH PLUG — Core plug, expansion plug.

FUEL

ACCELERATOR — Throttle pedal.
ACCELERATOR PUMP — Throttle pump, carburettor pump.
AIR CLEANER — Air filter, air silencer.
BI-METAL SPRING — Thermostat spring.
CHOKE — Strangler, cold starter.
CHOKE VALVE — Choke butterfly.
COMPENSATING JET — Secondary jet.
DASHPOT — Piston damper.
FUEL PUMP — Petrol pump, lift pump.
IDLE JET — Slow running jet, low speed jet.
IDLING MIXTURE SCREW — Volume control screw, mixture control screw, mixture timing screw.
MAIN JET — Primary jet.

SECONDARY JET — Compensating jet.
THROTTLE STOP SCREW — Idling speed screw.
THROTTLE VALVE — Accelerator butterfly.
VENTURI — Choke tube.

CLUTCH

CLUTCH HOUSING — Clutch cover, clutch bell housing.
DRIVEN PLATE — Clutch plate, driven disc, clutch disc.
DRIVEN PLATE FACINGS — Driven plate linings, clutch linings, friction facings.
PRESSURE PLATE — Clutch drive plate.
PRESSURE PLATE COVER — Clutch housing, clutch cover.
RELEASE BEARING — Throw-out bearing, thrust bearing, withdrawal bearing.
RELEASE BEARING PLATE — Throw-out bearing plate, thrust plate.
RELEASE LEVER — Clutch fork, release fork, throw-out lever, withdrawal lever.
SLAVE CYLINDER — Clutch cylinder, operating cylinder, actuating cylinder.

TRANSMISSION

FIRST SPEED — Low gear, first gear, bottom gear.
GEAR SHIFT LEVER — Change speed lever, gear selector lever, gear change lever.
INPUT SHAFT — Clutch shaft, first motion shaft, main drive shaft, primary shaft, main drive gear, spigot shaft.
LAYGEAR — Cluster gear, second motion gear, intermediate gear.
LAYSHAFT — Cluster gear shaft, second motion shaft, intermediate shaft, counter shaft.
MAINSHAFT — Third motion shaft, output shaft, secondary shaft.
NEEDLE BEARINGS — Roller bearings.
PROPELLER SHAFT — Propshaft, drive shaft, tail shaft.
REVERSE IDLER GEAR — Reverse pinion.
SELECTOR SHAFT — Selector rod, selector rail, shift rail, shift rod, shifter shaft.
SHIFT FORK — Selector fork, shifter fork.
SNAP RING — Circlip, spring clip.
SPIGOT BEARING — Pilot bearing, support bearing.
SYNCHRO HUB — Clutch hub.
SYNCHRO PLATE — Synchro bar, synchro key.
SYNCHRO RING — Baulk ring, synchro cone.
SYNCHRO SLEEVE — Clutch sleeve.
SYNCHRO SPRING — Clutch spring, energising spring.
TOP GEAR — High gear, high speed.
TRANSMISSION — Gearbox.
UNIVERSAL JOINT — Drive coupling, Hardy-Spicer joint.
UNIVERSAL JOINT CROSS — Joint trunnion.
UNIVERSAL JOINT YOKE — Universal joint fork.

REAR AXLE

AXLE SHAFT — Drive shaft, half shaft.
AXLE SHAFT BEARING — Rear wheel bearing, rear axle race, rear hub bearing.
CARRIER BEARING — Differential bearing, side bearing.
CROWNWHEEL — Ring gear, final drive gear, spiral drive gear.
DIFFERENTIAL PINION — Spider pinion, pinion gear, planet wheel.
DIFFERENTIAL SIDE GEAR — Axle shaft gear, spider gear, sun wheel.
DRIVE PINION — Final drive pinion, bevel pinion, spiral drive pinion.
PINION FLANGE — Drive coupling.

SUSPENSION/STEERING

BUMP RUBBER — Bumper, bump stop, rebound rubber.
CONTROL ARM — Wishbone, suspension arm, link, track control arm.
CONTROL ARM BALL JOINT — Upper ball joint, lower ball joint.
CONTROL ARM SHAFT — Fulcrum pin, fulcrum shaft, pivot pin.
IDLER ARM — Intermediate lever or arm.
PITMAN ARM — Steering arm, drop arm, sector shaft arm.
SECTOR SHAFT — Roller shaft, pitman arm shaft, drop arm shaft.
SHOCK ABSORBER — Damper.
STABILISER BAR — Ride stabiliser, away bar, anti-roll bar.
STEERING ARM — Knuckle arm, steering lever, pitman arm.
STEERING CONNECTING ROD — Relay rod, drag link.
STEERING GEAR — Steering gearbox, steering box, rack and pinion.
STEERING LINKAGE — Track rods, tie rods.
STEERING SHAFT — Steering column.
STUB AXLE — Swivel axle.
STUB AXLE SUPPORT — Steering knuckle support, swivel link, control arm link.
SUSPENSION STRUT — Suspension leg, MacPherson Strut.
TIE ROD BALL JOINT — Tied rod end, track rod end.
TORQUE RODS — Anti-tramp rods.
WHEEL ALIGNMENT — Toe-in, track alignment, tracking.
WISHBONE — Control arm, suspension arm.

BRAKES

BACKING PLATE — Brake plate, back plate.
FLEXIBLE BRAKE PIPE — Brake hose. flexible connector.

HANDBRAKE — Parking brake.
LININGS — Shoe facings, friction facings.
PISTON — Plunger.
PRESSURE DIFFERENTIAL VALVE AND WARNING SWITCH — Brake line pressure warning switch, hydraulic safety switch.
PRESSURE LIMITING VALVE — Brake pressure regulator, pressure reduction valve, pressure conscious reducing valve.
PRIMARY CUP — Main cup, main rubber seal.
RETURN SPRING — Pull-off spring, retractor spring.
SECONDARY CUP — Piston seal.
VACUUM SERVO UNIT — Servo, power brake unit, brake booster unit.
WHEEL CYLINDER — Actuating cylinder, brake cylinder.
WHEEL CYLINDER CUP — Wheel cylinder rubber, wheel cylinder seal.

ELECTRICAL

ALTERNATOR — AC Generator.
ALTERNATOR-REGULATOR — Voltage regulator, control box.
BULB — Lamp, globe.
CAPACITOR — Condenser.
CONTACT BREAKER POINTS — Contact points, circuit breaker contacts.
COURTESY LAMP — Interior light, roof light.
DIPPER SWITCH — Dimmer switch.
DISTRIBUTOR — Timer.
FUEL GAUGE — Petrol gauge.
GENERATOR — Dynamo.
GENERATOR-REGULATOR — Voltage regulator, control box.
HARNESS — Loom.
HAZARD WARNING SYSTEM — Emergency flashers.
HEADLAMP — Head light, main light.
HIGH TENSION LEADS — Plug wires, plug leads.
HORN PUSH — Horn switch, horn button.
INSTRUMENT LAMP — Panel light.
LAMP — Light.
LENS — Glass, crystal.
MEDALLION — Name plate, cover, motif, emblem.
NUMBER PLATE LAMP — Licence plate light.
PARKING LAMP — Side light, side lamp.
ROTOR ARM — Rotor button.
STOP LAMP — Brake light.
STARTER — Starter motor.
STARTER DRIVE — Bendix gear, drive pinion.
TAIL LAMP — Rear light, tail light.
TEMPERATURE GAUGE — Heat gauge.
TURN SIGNAL LAMP — Direction indicator light, flasher light, trafficator light.
TURN SIGNAL RELAY — Flasher unit.
TURN SIGNAL SWITCH — Direction indicator switch, flasher switch, trafficator switch, indicator stalk.

VACUUM ADVANCE UNIT — Advance and retard unit, vacuum advance, vacuum capsule.
WARNING LAMP — Indicator light.
WINDSCREEN WIPER — Windshield wiper.

BODY

BONNET — Hood, engine compartment lid.
BULKHEAD — Scuttle, firewall.
BUMPERS — Bumper bar, fender.
DOOR GLASS — Door window, window glass.
FENDER — Mudguard, wing.
GLASS LIFT CHANNEL — Window lift channel.
GLASS REGULATOR — Window lift regulator, window winder.
GLASS RUN CHANNEL — Glass channel, glass runner, bailey channel.
HEADLINING — Roof lining, head cloth.
LUGGAGE COMPARTMENT — Boot.
MOULDING — Chrome strip, finishing strip.
PANEL — Skin.
REAR GLASS — Back light, rear screen, back window.
VENTILATOR GLASS — Quarter light, no draught ventilator, vent glass, quarter glass, flipper window.
WEATHERSTRIP — Weathershield, glazing channel, door belt weatherstrip.
WINDSCREEN — Windshield.

COMMON ABBREVIATIONS

AC — Alternating current.

APS — Air preheat system.
atdc — After top dead centre.
bbdc — Before bottom dead centre.
bdc — Bottom dead centre
bhp — Brake horse power
btdc — Before top dead centre
cc — Cubic centimetre.
CVJ — Constant velocity joint.
Cyl — Cylinder.
DC — Direct current.
Deg — Degrees.
EEC — Evaporative emission control.
EGR — Exhaust gas recirculation.
EP — Extreme pressure.
FWD — Front wheel drive.
HC — High compression.
HD — Heavy duty.
HT — High tension.
LC — Low compression.
LH — Left hand.
LT — Low tension.
MS — Manufacturers' specification.
OHC — Overhead camshaft.
OHV — Overhead valves.
PCV — Positive crankcase ventilation.
RH — Right hand.
rpm — Revolutions per minute.
SC — Single carburettor.
TC — Twin carburettor
TCS — Transmission control switch.
tdc — Top dead centre.
TVS — Thermal vacuum switch.
UJ — Universal joint.
VAC — Vacuum advance control.

GREGORY'S AUTO SERVICE MANUAL LISTING

AUSTRALIAN SERIES

	Book No.		Book No.		Book No.		Book No.
MOTOR VEHICLES							
AUSTIN		Falcon/Fairlane XA, XB, ZF, ZG, 8 cyl. (1972-76)	156	Torana UC 6 cyl. (1978-79)	115	Passat (1974-77)	152
1800 MKI, MKII (1965-70)	66	Falcon XC, 6 cyl. (1976-79)	160	HONDA		Superbug (1971-75)	45
CHRYSLER		Falcon XC 8 cyl. (1976-79)	179	Accord (1977-81)	196	Type 3 (1963-73)	47
Centura KB, KC 6 cyl. (1975-79)†	300†	Falcon XD 6 cyl. (1979-82)	165A	Civic Automatic (1973)	139	Commercial 1700, 1800, 2000 (1973-81)	151A
Chrysler CJ-CK 6 cyl. (1973-76)	157	Falcon XD 8 cyl. (1979-82)	126	Civic Manual (1973)	140	Transporter (1954-72)	48
Galant GA, GB (1971- 74)	05	Fairlane ZH (1976- 79)†	303†	JAGUAR		VOLVO 140 SERIES	
Galant GC, GD (1974- 78)	17	Fairlane ZJ, LTD FC 6 & 8 cyl (1979-82)	206	Jaguar MK VII, MK VIII, MKIX, XK 120 XK 140, XK 150 (1949-61)	21	Carburettor Model (1967-72)	53
Lancer LA, LB (1974- 79)	162	Falcon XE, Fairlane ZK 6 cyl, except EFI (1982-83)	208	Jaguar MKI, MKII (1956-61)	22	Fuel Injection Model (1970-72)	54
Sigma GE 1600-1850- 2000-2600 (1978-80)	116A	Laser (1981-82)	197	LEYLAND/MORRIS		ROTARY MOWERS, SMALL ENGINES AND TRACTORS	
Sigma GH 1600-2000- 2600 (1980-81)	189	Telstar, TX5 (1983-)*	215*	Marina 4 cyl. 1500- 1750 OHC (1972-75)	03	Victa Series (1955-84)	220
Valiant R, S, AP5, AP6, VC, VE, VF 6 cyl. (1962-70)	78	HILLMAN		Mini (1971-78)	02	Victa single and twin cylinder (1977 on)	161
Valiant AP6, VC, VE, VF, 8 cyl. (1965-70)	69	Hunter, Arrow HB, HC (1967-70)	79	Mini (except Club- man) (1961-71)	64	Small engines	199
Valiant VG, VH 6 cyl. (1970-73)	52	Imp (1964-70)	38	Morris 8E, 10M, Minor MM-II (1939-56)	119	Massey Ferguson FE65, FE35	186
Valiant VJ, VK 6 cyl. (1973-77)	157	HOLDEN		Morris Minor 1000 (1957-61)	24	Massey Ferguson TE20- FE35	187
Valiant CL-CM 6 cyl. (1976-81)	192	Camira JB (1982-83)	210	Morris 1100 (1964-69)	65	OTHER TITLES	
Valiant/Chrysler 8 cyl VG Onwards (1970-81)†	309†	Commodore VB 6 cyl. (1978-80)	117	P76 8 cyl. (1973-74)	04	Car Repairs Made Easy	204
DATSUN		Commodore VB 8 cyl. (1978-80)	124	MAZDA		Motor Vehicle Log Book	217
1000, 1200 (1967-74)	87	Commodore VC 6 cyl. (1980-81)	183	1000, 1300 (1967-73)	92	Four Wheel Drive Handbook*	218*
120Y (1974-79)	111A	Commodore VC 4 cyl. (1980-81)	185	Capella 1600 (1970- 73)	89	UNITED KINGDOM SERIES	
Bluebird (1981-82)	191	Commodore VC 8 cyl. (1980-81)†	305†	1500, 1800 (1967-73)	90	MOTOR VEHICLES	
Stanza (1978-83)	205	Commodore VH 6 cyl. (1981-82)	193	Rotary R100, RX2 (1969-74)	91	Austin Allegro 1500, 1750 OHC (1973-78)	51
Sunny 1200-1400-1500 (1979-81)	195	Commodore VH 4 cyl. (1981-82)	207	626 (1979-83)	181	Austin Allegro 1100, 1300 OHV (1973-78)	25
1300, 1600 (1968-72)	88	Commodore VH 8 cyl. (1981-82)	209	323 (1977-80)	182	Austin Maxi 1500, 1750 OHC (1969- 76)	149
160B, 180B (1972-77)	110	Gemini TX (1975- June 76)	113	323 F.W.D. (1980-82)	202	BLMC Princess 1800, 1800 HL including 18/22 series (1975- 1978)	167
200B (1977-81)	175A	Gemini TC, TD (1977- 79)	118	MITSUBISHI		BLMC 1100, 1300 MKII, MKIII (1967-74)	148
Skyline (1978-80)†	301†	Gemini TE (1979-82)	190	Express L300 1600 engine (1980-83)*	213*	Capri MKI 1300, 1600, V4 2000 (1969-74)	166
240K (1973-78)†	302†	Holden FX, FJ, FE, FC, FB, EK, EJ, EH, HD, HR (1948- 68)	67	Sigma GH 1600-2000-2600 (1981-82)	189	Ford Capri II 1300 OHV, 1600, OHC, 2000 OHC (From 1974)	09
FORD		Holden HK, HT, HG 6 cyl. (1968-71)	86	RENAULT		Hillman Hunter and Sceptre 1500, 1750 (1970-76)	37
Capri 1600 (1969-74)	82	Holden HK, HT, HG 8 cyl. (1968-71)	85	Renault 12 (1975-76)	32	Morris Marina 1.3, 1.8, 1.8TC (1971-77)	142
Consul/Zephyr MKII (1956-62)	08	Holden HQ, HJ 6 cyl. (1971-76)	146	TOYOTA		Skoda Saloon & Coupe S100, S110 (1970-77)	168
Cortina MKI, MKII (1962-71)	68	Holden HQ, HJ 8 cyl. (1971-76)	147	Corolla 1100 (1967- 70)	73	Spitfire 1300, 1500 (1970-78)	173
Cortina TC 4 cyl. (1971-74)	60	Holden HX, HZ 6 cyl. (1976-80)	177	Corolla 1200 (1970- 78)	122A	Triumph Toledo 1300 (1970-76)	171
Cortina TC 6 cyl. (1972-74)	59	Holden HX, HZ 8 cyl. (1976-80)	178	Corona 2R (1964-70)	83	Vauxhall Cavalier 1600, 1300 (1600 from 1975, 1300 from 1977)	170
Cortina TD 4 & 6 cyl. (1974-77)†	306†	Holden WB commercial series 6 cyl. (1980-82)	201	Corona 12R (1971-73)	123	Vauxhall Viva, Firenza 1159, 1256 OHV (1970-78)	57
Cortina TE 4 cyl. (1977-80)	158A	Sunbird UC 4 cyl. (1978-79)	150	Corona 1800, 2000 (1974-June 76)	120		
Cortina TE 6 cyl. (1977-80)	180A	Torana UC 4 cyl. (1974-78)	16	Corona 2000 (July 1976-79)	127		
Cortina TF 4 cyl. (1980-82)	194	Torana HB (1967-69)	72	Corolla 1300 (1978-81)	184		
Cortina TF 6 cyl. (1980-82)	198	Torana LC, LJ, TA (1159, 1256 (1969-75)	56	Corona 1892 (1979-80)	188		
Escort MKI (1970-75)	81	Torana LC, LJ, TA 1600, 1760 (1971-75)	145	Corona MKII 6 cyl. (1972-77)†	304†		
Escort MKII (1975-76)	20	Torana LC, LH, 6 cyl. (1969-74)	84	Hi Ace RH series 18R-C engine (1977-83)*	203*		
Escort BC (1977-81)	125	Torana LH, LX 6 cyl. (1974-78)	58	Landcruiser FJ series (1975-83)	211		
Falcon XK, XL, XM XP, XR, XT, XW, 6 cyl. (1960-70)	62			TRIUMPH			
Falcon/Fairlane XR, XT, XW, XY, ZD 8 cyl. (1966-72)	154			TR2, TR3, TR4 (1954-63)	44		
Falcon/Fairlane XY, XA, XB, ZD, ZF, ZG 6 cyl. (1970-76)	155			VOLKSWAGEN			
				Beetle (1954-71)	46		
				Golf carb. series (1974-77)	153		

* DENOTES MANUALS IN PRODUCTION

† DENOTES SERVICE AND MAINTENANCE MANUAL ONLY